Considerations for the Planning and Use of Industrial Steel Storage Racks

SOLVE FOR X.

Presented by:

Nelson Cantillo, Tri-Boro Storage Products

John Krummell, Advance

Carlos Oliver, Frazier

Seminar Objectives

The objective of this seminar is to expose the participant to the latest array of racking products available and how to make the best assessment for their facility. Topics include:

- Types of Steel - Structural and Roll Formed Racks
- Various storage racking configurations available
  - Pros and Cons
  - Budget costs
- Accessories
- RMI Repair Guidelines
- Q&A

Roll-Formed Racks

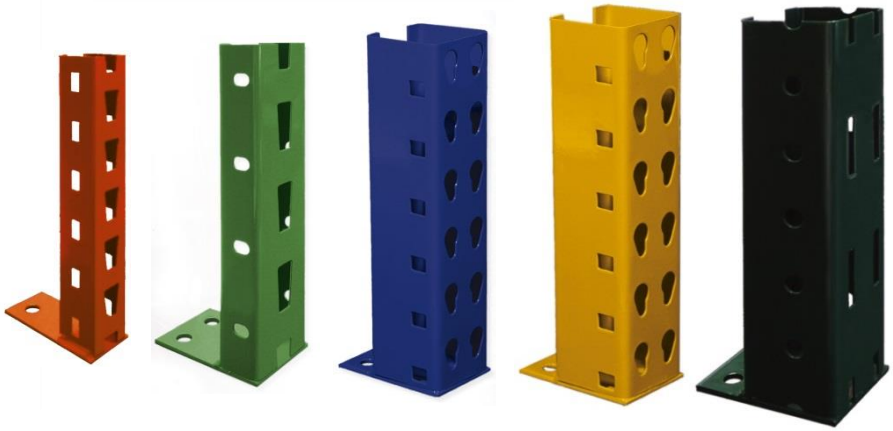
Pros:	Cons:
Most economical	Easily damaged
More versatility	
Easy to reconfigure	
Lower cost for installation	

Beams:	Uprights:
Sizes based on capacities	3x1-5/8, 3x3, 4x3
Range from 2.5” to 6” profile	Typically 11, 12, 13, 14 gauge
Typically 14, 15, 16 gauge	

Roll Form Styles:

Teardrop (most common)

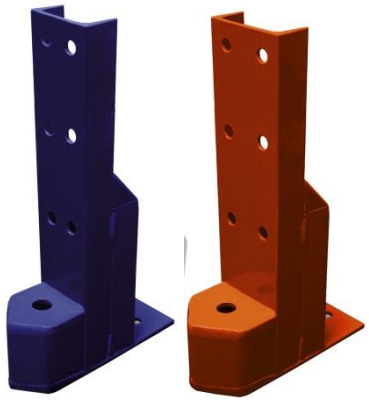
Keystone



Structural Steel Racks

Pros:	Cons:
Heavy Duty	Weighs more/costs more
Damage resistant	More expensive to install
Bolted connections	
Higher capacities	

Beams:	Frames:
Size based on capacity	Size based on capacity
Range from 3” to 8” profile	F3 – Light & Heavy
Light & heavy for each size (ex. C3 has 3.5 lb. ft. & 4.1)	F4 – Light & Heavy
	F5 – Light & Heavy



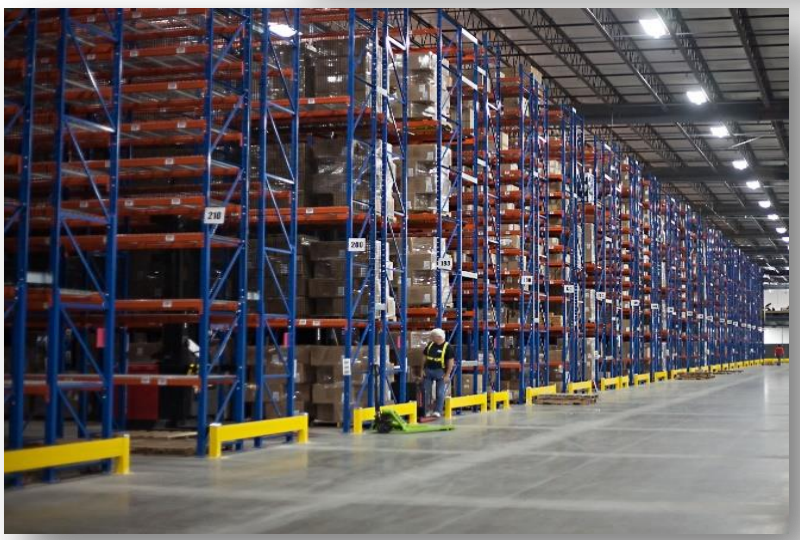
Selective Racking

Pros:

- High Selectivity
- Lower Cost

Cons:

- More Aisles
- Less Cube Utilization



Selective Double Deep

Pros:

- Higher storage density
- Less expensive than 2 deep push-back

Cons:

- Fork extensions
- Wider aisles
- Productivity loss
- Wider bays - 102” vs. 96”

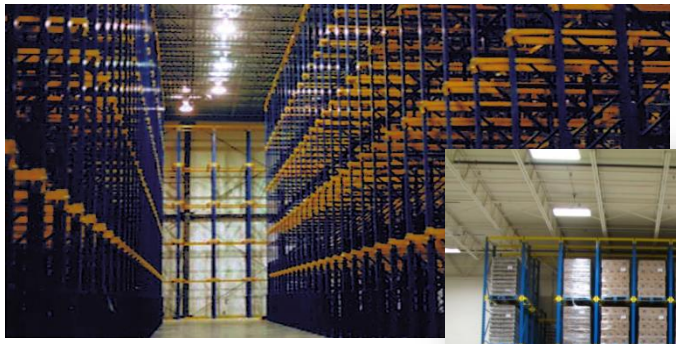
Drive-in and Drive-thru Racks

Pros:

- High density storage
- Best suited for common products

Cons:

- Narrow fork truck lane
- Slow through-put
- Possible damage to racks
- First in, last out (FILO)
- Requires pallets in good condition
- Requires large span of open space
- Poor utilization (60-70% typical)



Double Pallet Drive-In Racks

Pros:

- Faster storage and retrieval – 2-4 pallets at a time
- Less posts = 20% more storage per square foot of floor area
- Wider lane = less damage to racks from forklift

Cons:

- Need same type products in each lane, low selectivity
- Slightly more expensive than standard drive-in

Push-Back Racks

Pros:

- More selectivity and higher utilization than drive-in
- Carts can be modified for various size pallets
- Up to 6 pallets deep
- Faster through-put than drive-in
- Less rack damage

Cons:

- LIFO (Last in, first out)
- Higher per pallet cost
- Needs more vertical space due to cart stacking and rail slope

Pallet Flow Racks

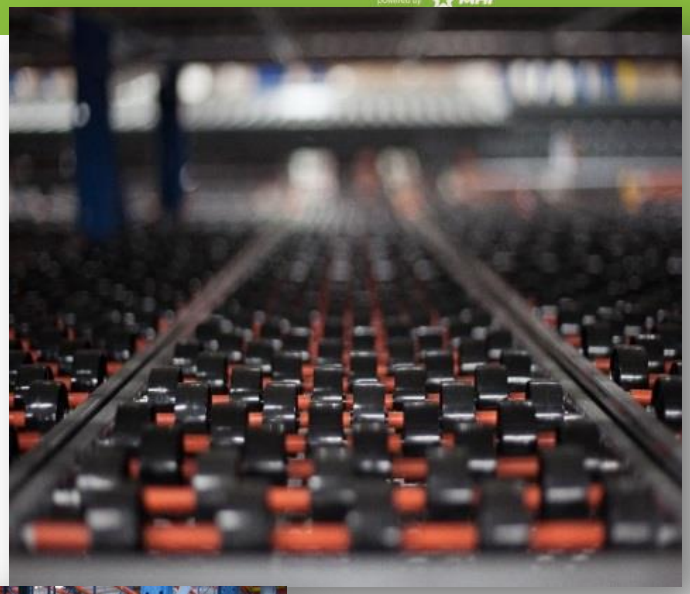
Pros:

- High density storage – deep lane
- First in, First out (FIFO)

Cons:

- Most expensive style racks
- Slope of tracks takes vertical space
- Pallets sometimes get stuck
- Pallet specs are CRITICAL
  - *Style of pallet?*
  - *Plastic / Wooden? Board Direction?*
  - *Weight? Max and min.*
  - *Brakes? Pitch?*

Carton Flow Racks



Available with:

- Pencil Roller Beds
  - Fixed Track/Box Width
- Staggered Wheels
  - Easy to adjust lane size

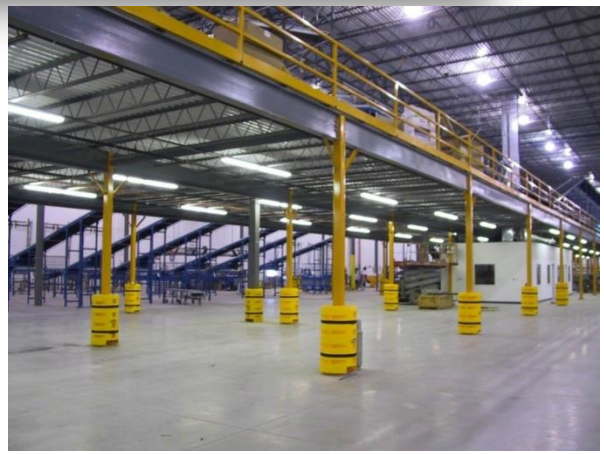
Used for:

- Case picking
- Open case picking
- Back-up stock
- Multiple size boxes

Fits in standard racks or
Separate support frames

Mezzanines

Rack Supported



Wide Span

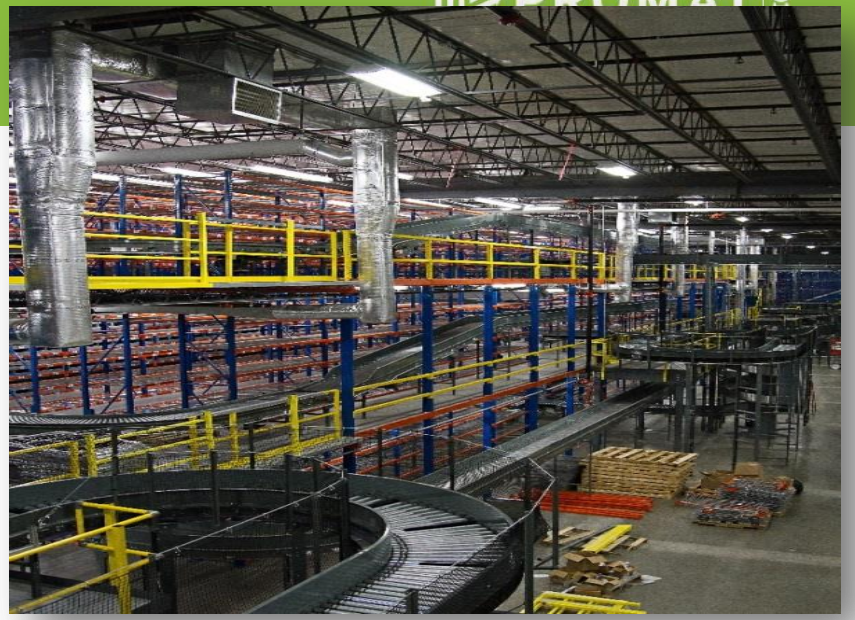
Mezzanines for Optimizing Space

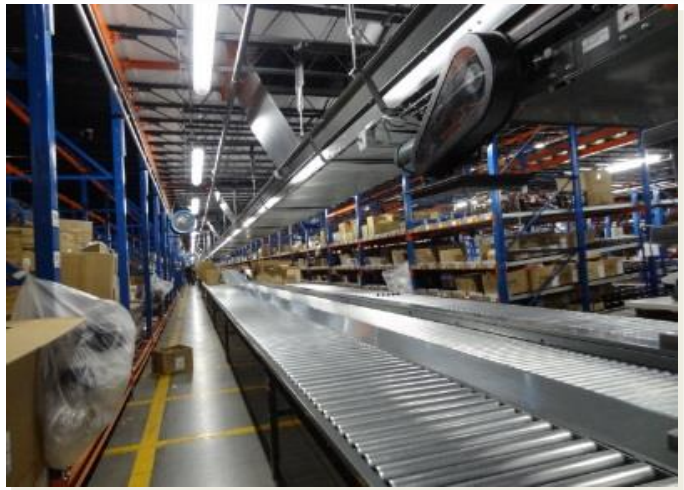
Mezzanine supporting racks above allows work area below

Double level mezzanine supporting conveyors above dock doors

Pick Modules

- Pick, pack and ship operations
- Multiple styles of rack (carton flow, push-back, selective, pallet flow)
- Integrated with conveyor systems
- Lighting
- Sprinklers

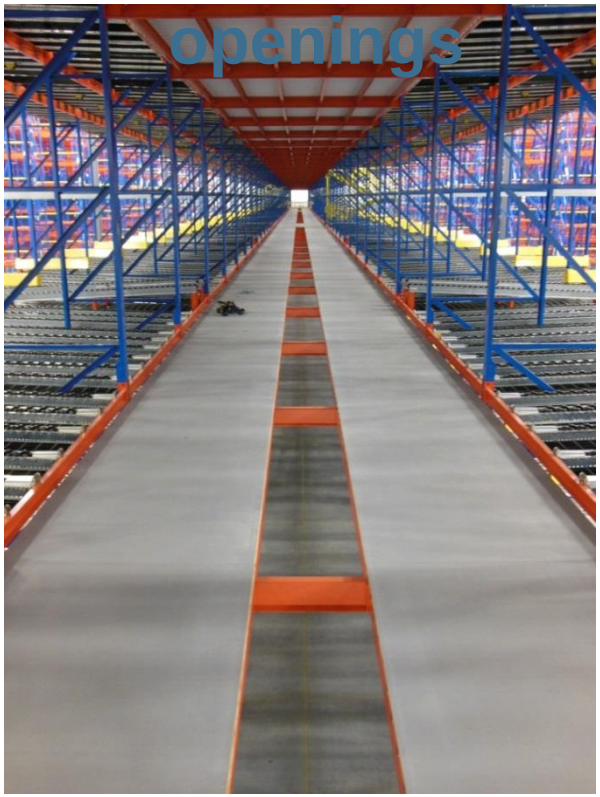




Pick Modules

Pallet flow picking

Trash conveyor openings



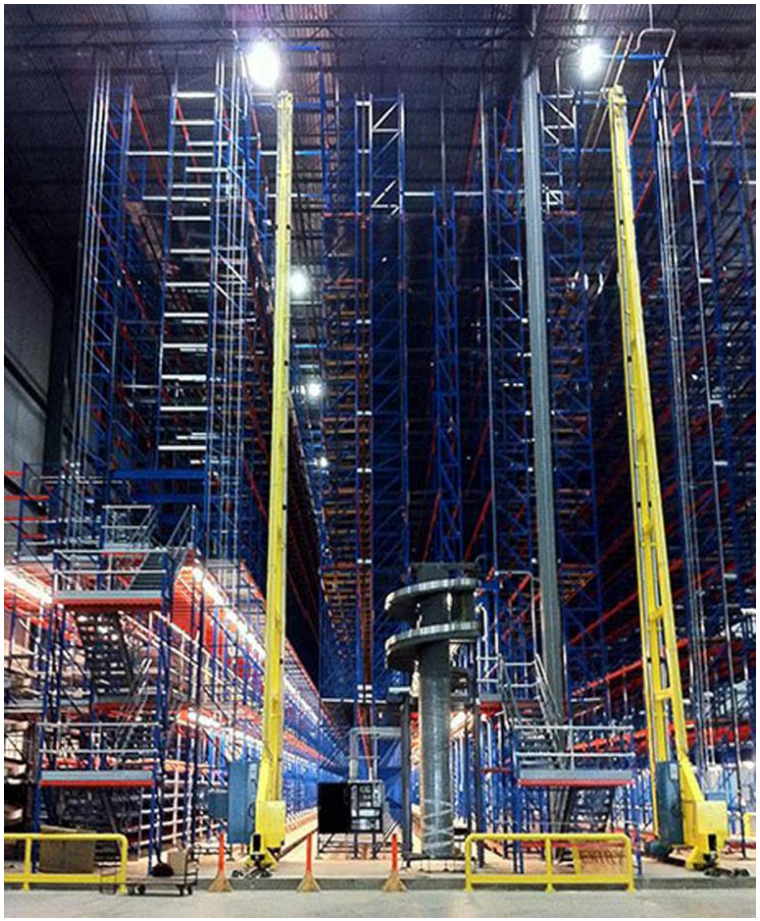
Archive Storage Racks

Narrow Aisle 30” Catwalk Systems

Multi-Level Records Storage (and/or Parts Storage) with VRC

Hi-Rise AS/RS and Pick Modules

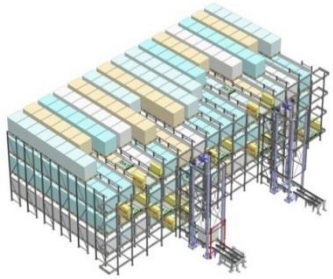
- 40’ - 120’ Tall
- AS/RS Cranes
- Pick Module Platforms
- Pallet Flow
- Carton Flow
- Conveyor Systems
- Rack supported buildings
- Highest cost racks per pallet position
- Tight tolerance requirements



Pallet Shuttle Systems

Pros:

- Increased productivity and throughput
- Semi-Automatic loading and unloading
- Less forklifts and operators required
- Reduced labor costs
- Less damage to products and racks
- Depth of tunnel is limitless
- High density - 85% space utilization
- FIFO & LIFO
- Multiple size pallets in the same lane



Cons:

- Maintenance and recharging of shuttles
- Must move shuttles
- Limited to number of shuttles
- Productivity vs push-back is less
- Suited for clearing entire lanes not single pallets

Budget Price Review

- Selective Racks: $65-75 per pallet
- Double Deep Racks: $75-85 per pallet
- Drive-in Racks: $95-110 per pallet
- Push-back Racks: $100-175 per pallet
- Pallet Flow Racks: $200-300 per pallet
- Shuttle Racks: $150-250 per pallet

Cantilever Racks

- Structural
- Roll Formed

- Retail
- Lumber
- Furniture
- Steel Service
- Home Improvement
- Odd size products

Accessories

Wide Selection

Accessories

- Guard rails
- Column protectors
- Rail guidance

Agenda

RMI "*Guideline for Assessment and Repair or Replacement of Damaged Rack*"

- Why is Rack Repair Important?
- Repair and Replacement Principles
- Repair Options and Implementation

	
Defective Field Welding	Unsafe Field Bracing Repair

Damaged and Poor Repair

Damaged Upright Column

Damaged column with home grow repair

There can be *Consequences* for Ignoring Damage

Principle/Owner Responsibility

- Maintenance and safe operation of the system
- Ensuring that all work is performed under engineering supervision
- Maintenance and retention of system documentation

Supervising Engineer

- All work overseen by a Supervising Engineer
- Each project must be evaluated individually

Principles
Evaluate the System

- Rack repair design must address all of the loads imparted on the damaged members (static, seismic, etc.), not just the individual members being repaired
- The Supervising Engineer determines the scope of the analysis required
- RMI/ANSI standards provide the framework for most of the design work

Principles
Rack Systems Must Meet Code

- Documented systems still in place
  - Can be evaluated under original codes
- Undocumented or relocated systems
  - Must be evaluated under current building codes
- The process/designation is at the Supervising Engineer's discretion

Repair Options

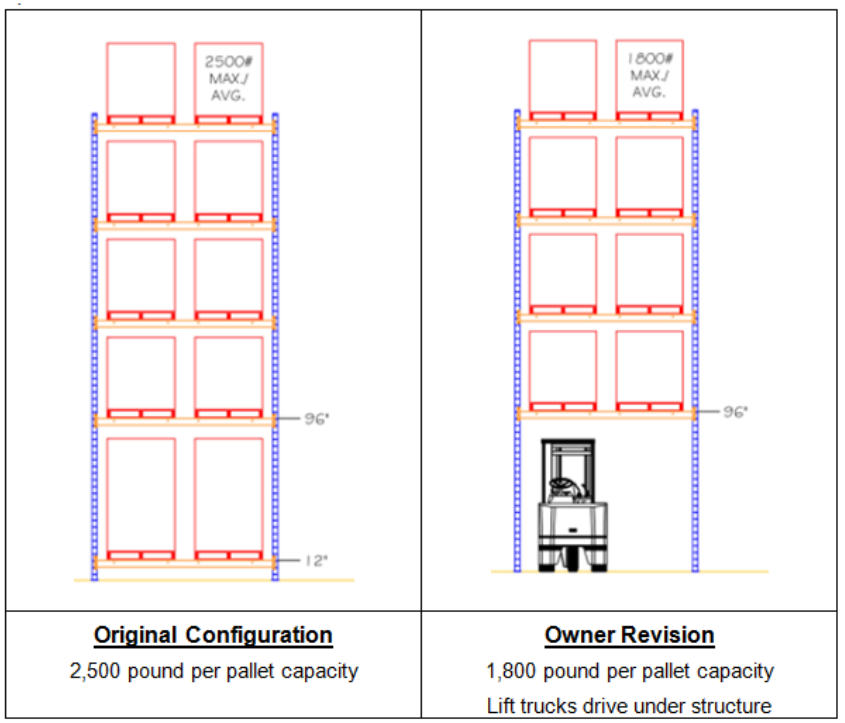
- Replacement vs. Repair Kits are both viable options - as long as engineering work is performed
- Benefits and downsides for both
- Field welding is discouraged

Repair Assessment

- Process/protocol developed and overseen by Supervising Engineer
- Field assessor can perform work
- Recommend to fix all damage identified in need of repair

Repair the System vs. Repair the Component

- Owner reconfiguration reduced capacity of rack from 3,000 lbs. to 1,800 lbs.
- Do not repair rack without first validating capacity.



Original Configuration	Owner Revision
2,500 pound per pallet capacity	1,800 pound per pallet capacity Lift trucks drive under structure

Engineering

- Refer to RMI/ANSI Specifications
- LARC drawings are required
  - At a minimum for the repaired section
  - Do not intend to force a full warehouse to be evaluated
- Discuss special conditions
  - Column splice
  - Bracing
  - Foot plates and anchors
  - Beams and intermembering

Installation

- Straight and Plumb (the entire frame)
- Splice cut joint tolerances
- Working with jacks
- Anchoring
- Hardware reuse

Repair Summary

- Guideline has been released and is available through the RMI website

RMI "Guideline for Assessment and Repair or Replacement of Damaged Rack"

www.mhi.org/RMI

Used Racking

Considerations:

- Damage?
- Comingling parts from different manufacturers?
- Is manufacturer still in business?
- Has the supplier provided structural calculations or proof of capacity?
- Engineering – just like new
- Permits – still required

RMI Members

RACK MANUFACTURERS INSTITUTE

- Advance Storage Products
- Atlanta Pallet Rack
- Bulldog Rack Company
- Elite Storage Solutions, LLC
- Engineered Products
- Equipement Boni Inc.
- Frazier Industrial
- Hannibal Industries, Inc.
- Husky Rack & Wire
- Interlake Mecalux Inc.
- Konstant
- Nanjing Huade Storage Equipment
- Nanjing Kingmore Logistics Equipment
- Nedcon USA, Inc,
- RackUSA
- Ridg-U-Rak, Inc.
- SpaceRak, Div. of Heartland Steel Products, Inc.
- Speedrack Products Group, Ltd.
- Steel King Industries, Inc.
- Tri-Boro Shelving & Partition Corp.
- Twinlode Corporation
- Unarco Material Handling, Inc.

Storage Rack Decking Group Members:

- Cornerstone Specialty Wood Products
- DACS, Inc.
- ITC Manufacturing
- J&L Wire Cloth LLC
- Nashville Wire Products, Inc.
- Ohio Gratings
- Prodeck 50 Inc.
- Worldwide Material Handling

Q & A

For More Information:

www.mhi.org/RMI

OR

Anupam Berry Rose

Managing Director for RMI

abose@mhi.org

For More Information:

John Krummell : jkrummell@asprack.com

Website: www.advancestorage.com

ProMat booth S1050

Carols Oliver: cpo@frazier.com

website: www.frazier.com

ProMat booth S3425

Nelson Cantillo: nelsoncan@triboro.onmicrosoft.com

website: www.triboroshelving.com

ProMat booth S414