

# Considerations for the Planning and Use of Industrial Steel Storage Racks



# PROMAT®

2015

McCormick Place South | Chicago  
March 23-26, 2015  
[promatshow.com](http://promatshow.com)

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## 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:

- Most economical
- More versatility
- Easy to reconfigure
- Lower cost for installation

### Beams:

- Sizes based on capacities
- Range from 2.5" to 6" profile
- Typically 14, 15, 16 gauge

### Roll Form Styles:

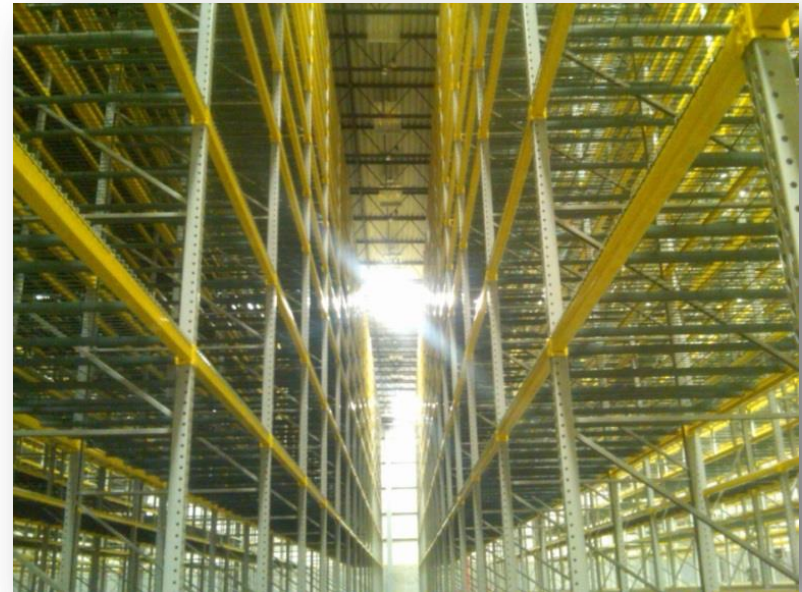
- Teardrop (most common)
- Keystone

### Cons:

- Easily damaged

### Uprights:

- 3x1-5/8, 3x3, 4x3
- Typically 11, 12, 13, 14 gauge





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# Structural Steel Racks

## Pros:

- Heavy Duty
- Damage resistant
- Bolted connections
- Higher capacities

## Beams:

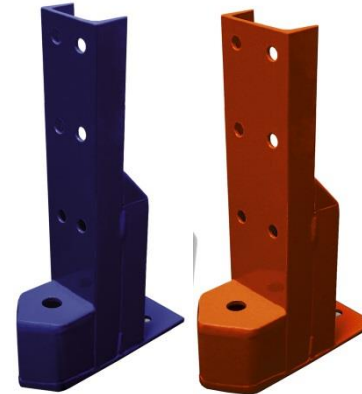
- Size based on capacity
- Range from 3" to 8" profile
- Light & heavy for each size  
(ex. C3 has 3.5 lb. ft. & 4.1)

## Cons:

- Weights more/costs more
- More expensive to install

## Frames:

- Size based on capacity
- F3 – Light & Heavy
- F4 – Light & Heavy
- F5 – Light & Heavy



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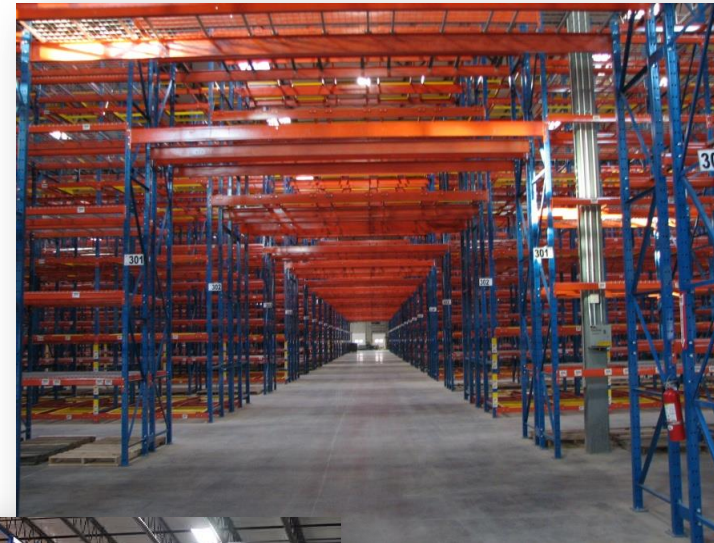
# Selective Racking

## 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?*





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# Carton Flow Racks

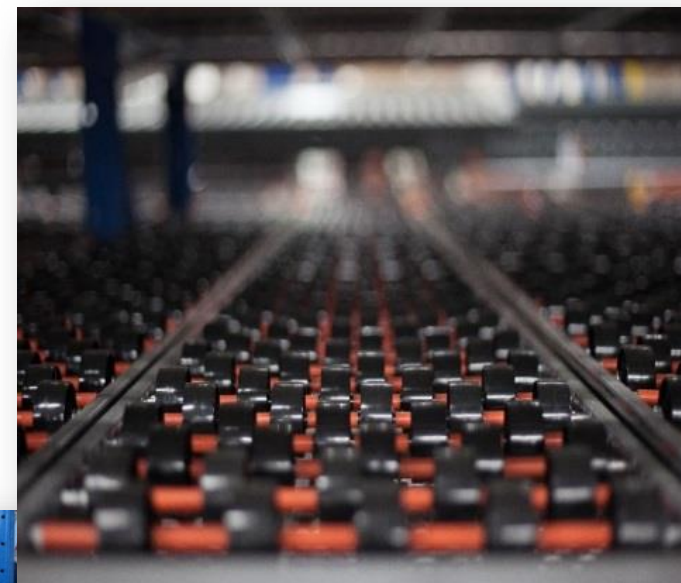
## Available with:

- 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





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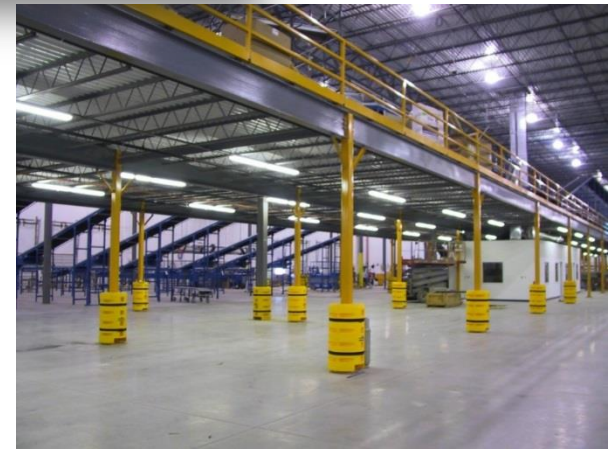
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# Mezzanines



**Rack Supported**



**Wide Span**

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# Mezzanines for Optimizing Space

Mezzanine supporting racks above allows work area below



Double level mezzanine supporting conveyors above dock doors





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# Pick Modules

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





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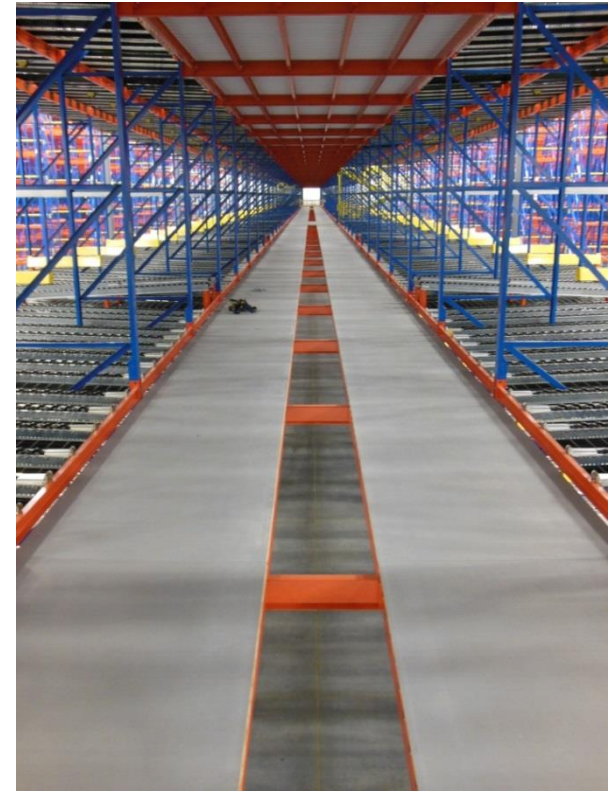
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# Pick Modules

## Pallet flow picking



## Trash conveyor openings



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# Archive Storage Racks

## Narrow Aisle 30" Catwalk Systems





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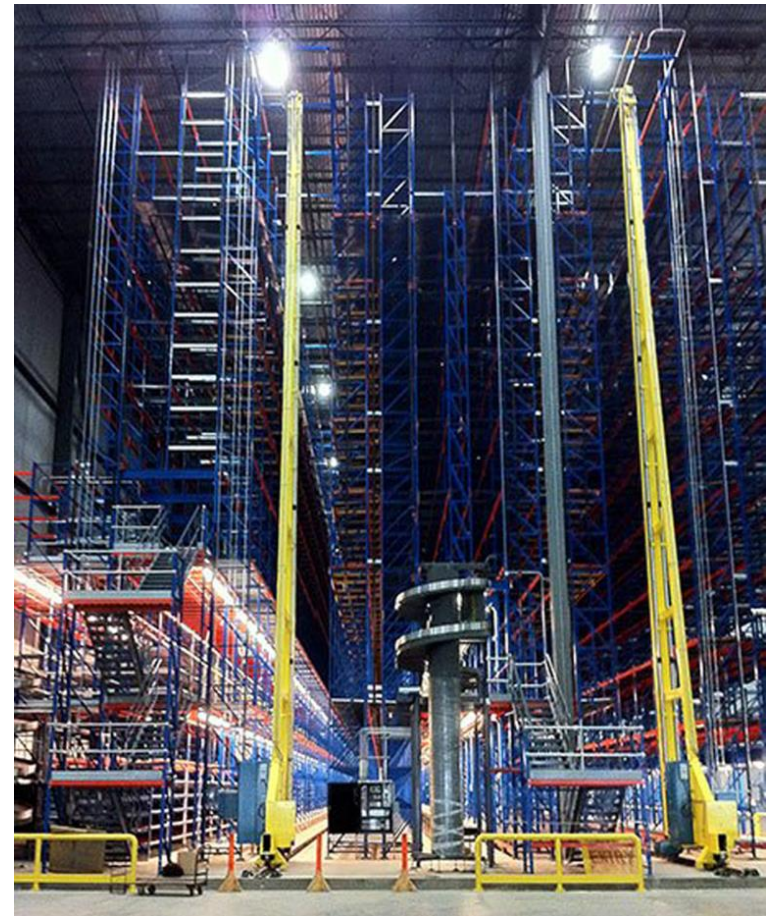
## Multi-Level Records Storage (and/or Parts Storage) with VRC





## 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



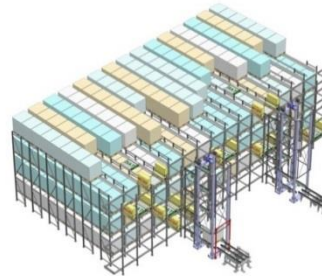
## Pallet Shuttle Systems

### Pros:

- Semi-Automatic loading and unloading
- Increased productivity and throughput
- 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

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# Cantilever Racks

- Structural
- Roll Formed
- Retail
- Lumber
- Furniture
- Steel Service
- Home Improvement
- Odd size products





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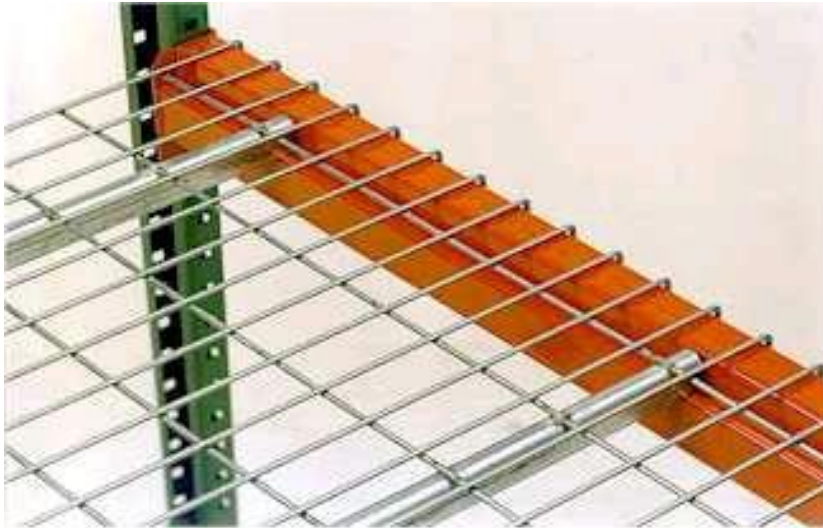
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# Accessories

## Wide Selection



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## Accessories

- Guard rails
- Column protectors
- Rail guidance







# ***RMI “Guideline for Assessment and Repair or Replacement of Damaged Rack”***

## **Agenda**

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

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# Damaged and Poor Repair



Defective Field Welding



Unsafe Field Bracing Repair



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# Damaged and Poor Repair



Damaged Upright Column



Damaged column with home grow repair

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## There can be *Consequences* for Ignoring Damage





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# 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

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# Repair Assessment

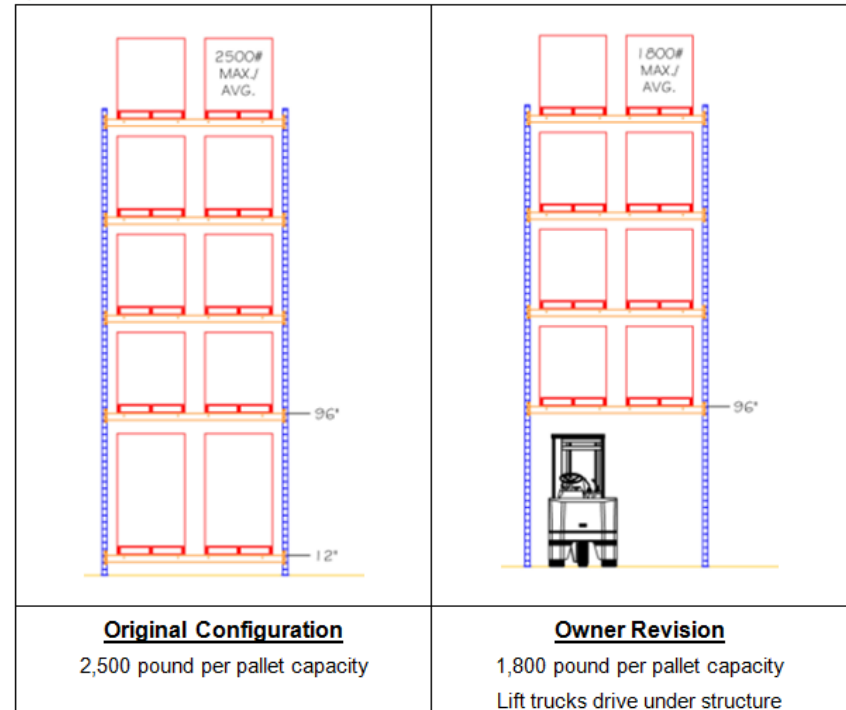
- Process/protocol developed and overseen by Supervising Engineer
- Field assessor can perform work
- Recommend to fix all damage identified in need of repair





## 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.





## 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

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# Installation

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



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# 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](http://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



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## Members

- Advance Storage Products
- Bulldog Rack Company
- DACS, Inc.
- Elite Storage Solutions, LLC
- Engineered Products
- Equipement Boni Inc.
- Frazier Industrial
- Hannibal Industries, Inc.
- Husky Rack & Wire
- Interlake Mecalux Inc.
- Konstant
- Necochea
- Nedcon USA, Inc.
- Ridg-U-Rak, Inc.

- SpaceRak, Div. of Heartland Steel Products, Inc.
- Speedrack Products Group, Ltd.
- Steel King Industries, Inc.
- Twinlode Corporation
- Unarco Material Handling, Inc.

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- Husky Rack & Wire
- ITC Manufacturing
- J&L Wire Cloth LLC
- Nashville Wire Products, Inc.
- Prodeck 50 Inc.
- Worldwide Material Handling



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# Q & A

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