FIND YOURS.

Storage Rack Safety 101

Presented by:
RMI Industry Group
Presenters

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About RMI

• Not-For-Profit Trade Association
• RMI was formed in 1958
• The RMI members are the Industry’s leading suppliers of Industrial Steel Storage Racks and Related Structural Systems. They supply industrial rack solutions worldwide and in virtually every major manufacturing and distribution sector.
• A current list of RMI Members can be found at:
  www.MHI.org/RMI/Members
About RMI

• Accredited Developer of American National Standards
• R&D programs for over 55 years resulting in virtually all advancements to the state of the art
• R-Mark Certification Program for both the storage rack and the wire decks
• Extensive National and International Liaison Programs
RMI Resources

• Wide array of education and research programs
  • Special Note – RMI has available an extensive planning and use document and guidelines for rack repair.

• RMI Guidelines
  • Considerations for the Planning and Use of Industrial Steel Storage Racks
  • Guideline for the Assessment and Repair or Replacement of Damaged Rack

• RMI Frequently Asked Questions
• RMI Rack Safety Blog

Find these and many more resources at –
www.MHI.ORG/RMI
Rack Manufactures Institute & Safety

Steve Johnson - V.P of Sales - Nashville Wire Products Inc.
Rack Safety Interest

Unsafe rack means loss of warehouse productivity
Rack Safety Interest

Column Damage
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Frame Bracing Damage
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Base Anchor Damage
Rack Safety Interest

Shelf Damage

Disengaged Connector
Rack Safety Interest

Decking Damage

Load Distributions

Line Load

In application  Line load problem  Failed Line Load
Rack Safety Interest

Load Damage or Misplacement
What Can Be Done?
Storage Rack Safety Accessories

Column Reinforcement on the Aisle
Storage Rack Safety Accessories

Column Protectors
Storage Rack Safety Accessories

Row End Protectors
Storage Rack Safety Accessories

Heavy Frame Bracing
Storage Rack Safety Accessories

Connection Lock
Storage Rack Safety Accessories

Bolt-in Shelf Bracing
Storage Rack Safety Accessories

Shelf Decking
Storage Rack Safety Accessories

Benefits of Wire Decking

Versatile storage options
Capacity rating with engineered safety factor
Meets fire codes (NFPA Code 13 (2007), F.M. 2.2)
Saves on insurance premiums (vs. solid shelving) conforms to national & local codes
Visibility
Brighter cleaner warehouse
Custom options and accessories
Solves problems and promotes safety!!
Storage Rack Safety Accessories

• Fire Codes

  • National Fire Protection Association
    • Code 13 (2007)
      – 3.9.3.8
      – A.3.9.3.6
      – A.3.9.3.7

  • FM Global
    • Factory Mutual 2.2

Wire Decking Reduces Fire Hazard
OPEN MESH PROVIDES QUICKER DETECTION AND EXTINGUISHING
Daniel Clapp – Director of Engineering, Frazier Industrial Co.
Your Storage Rack System
Rack Inspections

- Inspection required by Building Code
- Installation Inspection
- System Inspection
- Reconfiguration Inspection
- Repair Inspection
Building Code Inspection Requirements

• Rack Manufacturer should be an “Approved Fabricator” or special inspections of the fabricated items shall be performed during fabrication.  
  IBC 2018 1704.2.5

• Post-Installed Anchor installation is required to be inspected periodically.  
  IBC 2018 Table 1705.3 & RMI/ANSI MH 16.1 2012 Section 7.3.2
Installation Inspection

• Uprights plumb ½” in 10’ of height
• Shimmed of column for plumbness
  Cross-aisle & Down-aisle
  1/2” in 10’
• Properly locked beam to column connections
Installation Inspection

• Shelf elevation per Load Application and Rack Configuration Drawing
  (LARC Drawing)
Installation Inspection

• Floor Anchors
  • Size and location shown on installation instructions
  • Embedment into concrete
Installation Inspection

• Location of accessories
  • Column Reinforcing
  • Post Protectors
  • Back-to-back ties
  • Pallet Supports
  • Wire Decking
  • Back Stops

• Proper installation of accessories
Installation Inspection

- Load Plaque
  - One or more locations
System Inspection

• It is the owner/operator of the storage rack system’s responsibility to assure that the rack is used and maintained properly.

• If any damage occurs it is the responsibility of the rack owner to immediately unload, prevent from being used and properly repair or replace the affected portions of the rack before putting back into service.
System Inspection

• How Often?

- The more traffic in a portion of the storage rack system the more prone that area is to being damaged.
- The less expensive the product being stored in the rack system the more prone to that area being damaged.
- The narrower the handling equipment aisles the more prone that area is to being damaged.
- Areas with transfer aisles through the rack rows are more prone to being damaged.
- Areas that have been damaged in the past should be considered as prone to being damaged.
- Environment (Cold Cells)
System Inspection

• How Often?
  - The more prone the racks are to being damaged that more often they should be inspected for damage.
  - Racks with a high degree of damage potential (with 4 or more of the damage potentials above) should be inspected once a month.
  - Racks with a medium damage potential (with 3 or more of the damage potentials above) should be inspected quarterly (every 3 months).
  - Racks with a low damage potential (with any one of the above damage potentials) should be inspected twice a year.
  - All other rack systems should be inspected yearly.
  - After a seismic event.
System Inspection

Inspection reporting form
System Inspection

• What to inspect for?
  • Deviations from the Load Application Drawing.
  • Condition of the pallet and load on the pallet.
System Inspection

• What to inspect for?
  • Condition of the anchorage. Are the correct number of anchors in the baseplate? Have the anchors been broken off and/or pulled out of the floor? Are the nuts on the anchor bolts snug tight?
  • Condition of the column base plate. Is the baseplate attached to the column
  • Column
  • Frame Bracing
System Inspection

• What to inspect for?
  • Shelf Beam
  • Shelf Connection
  • Pallet Safety Bars
  • Wire decks
  • Other accessories
Reconfiguration Inspection

• Consult Load Application Drawing
  • Shows design alternatives
Reconfiguration Inspection

• What if the configuration needed is not shown on the LARC drawing?
  • Have the new configuration reviewed and approved by a qualified rack designer, preferably the original rack manufacturer
  • Get a revision to the LARC drawing
  • Get a revised Loading Plaque (if necessary)
System Inspection

• Everyone in the warehouse has an equal and ongoing responsibility for their co-workers Safety
  • Do Not Climb On Rack
    Use safety basket and fall protection
  • Stay In Handling Equipment
    Hands, Head, Legs - Everything
• Do Not Put Damaged Loads on Rack.
• Do Not Put Loads On Damaged Rack
Rack Manufactures Institute & Safety

Tom Koontz– Advance Storage Products
Inspection vs. Assessment

• Inspection: Careful Examination or Scrutiny.

• Assessment: The Evaluation or Estimation of The Nature, Quality, or Ability of Someone or Something.
6.0 Repair Assessment (*RMI Guidelines for...*)

• 6.1 - RMI Specification recommends that all damaged rack be isolated and evaluated by a qualified professional prior to repair or replacement of the damaged components. …

• 6.2 – Performing a proper assessment of damage can be more complicated than simply fixing the worst damage. Any process of assessing damage to a rack system must be conducted under the direction of a Supervising Engineer.
7.0 Repair the System vs. Repair a Component

• 7.1 – When repairing rack systems, the Supervising Engineer must evaluate the loads that are imparted on the damaged component, not just on the specific member being repaired. This evaluation is especially important with older systems that may have been moved or reconfigured during their lifetime. ...
International resources

- Canada – CSA-A344-17
  - CSA S16 – Annex N
- Europe – EN15 635
- U.K. - SEMA
- Australia - AS 4084-2012
Replace or Repair

“Guideline for the Assessment and Repair or Replacement of Damaged Rack” available from www.MHI.org/RMI
Replace

- Replacement is only with identical parts from the original equipment manufacturer (OEM)
- Anything else is repair
Replace

- Replace if parts are available
  - New from same OEM
  - Parts from other places in the system
  - May need to replace anchors in same location. They can be core drilled out.

- No need for engineering review
- The Load Application and Rack Configuration drawing still applicable. No need to revise
Repair

• Must be done under the supervision of and reviewed by an engineer for system structural adequacy. This engineer must understand they will be taking responsibility for the rack system.

• The Load Application and Rack Configuration drawing must be revised to show repair kit configuration and location. The LARC drawing, including the revised configuration and components, must be approved by the Engineer who supervised the repair.
Repair

Be aware that third-party aftermarket repairs and/or repair kits may not continue the structural adequacy of the original system.
Repair Kits

Must maintain frame bracing continuity.

No continuity in this area
Repair Kits

Must maintain frame bracing continuity.
Repair Kits

Column Splices designed to bear or must rely on bolt bearing.

Each ½” dia Gr5 bolt can hold 4,000 lbs from column above.
Repair Kits

Column Anchorage
Repair Kits

In Non-Seismic areas

• A good repair kit design might include
  • Thicker or reinforced column
  • Splice at mid-height between shelves above damage
  • Splice design that is stronger and stiffer than column
  • Frame bracing pattern continuous from floor to just below splice
  • Stiffer baseplate and anchorage.
Repair Kits

• The design of the repair kit needs to done with the approval of the original manufacturer.

• The bracing system has to be designed in unison with the original frame and system.

• The liability for any failure may rest on the owner.
Questions?
Peace of mind comes with a more durable rack system and a preventive maintenance program
For More Information

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