Rack Transport Stability Team (RTST)

Safer Handling Practices for Server/Storage Rack Products

“Together we deliver Success”

Version 3: Updated April 2012
**Disclaimer:**  This information is provided for convenience as is, and is provided only as a starting point for discussion. Each company or transporter may need to tailor the information for particular products or situations. The details contained in this presentation are subject to change.

In addition, the contents of this document do not constitute either: (1) legal advice; (2) a legal opinion; or (3) any representation, warranty, or guarantee regarding compliance with applicable legal requirements. Each company or transporter retains sole responsibility for determining its own compliance with applicable laws.
3 Stages of Handling: RTST Focus is on the first two areas*

**Transportation Environment** *
- Fork Lifts and pallet jacks
- Lift Gate Trucks
- Usually palletized but not always
- Padded Van, LTL and worse (Intl.)
- Air Cargo, Ocean Vessels
- Packaged tilt specs range from 15° to 30°

**Relocation / Installation Env.** *
- Ramps and other slopes
- Fork Lifts and Pallet Jacks
- Elevators, Hallways, Windows, Rooftops
- Manually Rolling on Casters
- Palletization & Good Pkg’g not assured
- Currently, no established Tilt Standard

**Operational Environment**
- Stationary: No physical movement
- Tip risk due to extended doors or hardware (servers, drawers)
- Tilt Standard is 10 degrees (IEC)
- Concerns with packaging related dust entering data centers.
Who is on the ISTA Rack Transport Stability Team (RTST)?

International Safe Transit Association (Project Consultant)

Benchmarking Partners (volunteers) from the Information Technology Industry and closely affected stakeholders and organizations with unique experience.

Valuable assistance including recommended handling demonstrations provided courtesy of McCollister's Transportation Group, Inc.
Agenda / Summary

- Introduction / Background / Objectives
- Summary of Rack Products and Packaging
- Damage Incidents & Root Causes
- Pre-Shipment Processes
  - Product Design standards
  - Rack Configuration Rules
- Shipment and Delivery Processes
  - Pre Delivery Checklist
  - Final Delivery Checklist
  - Proper and Improper Handling examples
- Special or Unusual Deliveries
  - Cranes and Riggers
  - Windows and Rooftops
- Summary, Wrap-Up

Lift Gate Failure

Potential Root Causes:
- Lift Gate was too small for this item
- Packaging removed while in the truck
- No load securement to prevent tipover
Introduction / Background / Objectives

- **Problem:** Catastrophic RACK TIPOVER incidents continue to occur
  - Potential for serious personal injury
  - Potential for extreme financial loss ($M's)

- **Typical or Possible Root Causes:**
  - Handling by inexperienced or untrained individuals, subcontractors, etc.
  - Failure to consistently execute known safer handling practices
  - Business Partners (clients) not adhering to product configuration limits
  - Improper handling equipment, general carelessness, excessive speed, etc.

- **Objectives of this Education Module**
  - Raise awareness of this problem to Business Partners and all Carriers
  - Communicate and emphasize safer handling procedures (new and old)
  - Goal: Reduce to ZERO these catastrophic incidents going forward
Why is this Important? Which Costs More? A or Group B?

A

Can exceed $1,000,000!
This one LOST due to mishandling!

B

Entire Group B is far less than $1,000,000
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Rack Products and Typical Packaging Methods

SUCCESS

Product Design

Quality of Handling

Prep Failure

Pkg Failure

Handling Failure

Product Failure

Package Design

Quality of Preparation
Typical Rack Style Products

(not all inclusive)
Rack Packaging Methods

Reusable (L) or One-Way (R) Export Crates:
Product is wholly contained inside and there is a built-in ramp feature*. Rack Frame may or may not be bolted to the base pallet.

Heavy Duty Clear View style or Corrugated Packs on Custom Pallets:
Product is bolted to the custom base pallet and there is often a built-in ramp feature*. This is the most common method.

* Important: when using the built-in ramp feature it is critical that the ramp be properly secured to the pallet using the provided bolts, pins, straps and support blocks per the instructions provided on the product or its packaging.
Alternative Rack Packaging Method (special case)

“Minimum Pack” method for domestic padded van large enterprise direct shipments:

Rack Product is NOT palletized. It is simply strapped to the sidewalls of the truck with lightweight corner and edge protection materials and is rolled on the product’s integral casters. This method is NOT suitable for common carrier (LTL) or international shipments.

Blanket Wrap
Damage Incidents and Root Causes

- Product Design
- Package Design
- Quality of Handling
- Quality of Preparation
- Prep Failure
- Handling Failure
- Pkg Failure
- Product Failure

SUCCESS
Lift Gate Failure

Proposed Mitigations:

1. Prohibit unpacking the rack products while on the truck.
2. Keep product on its pallet until fully into the client facility.
3. Ensure level lift gate
4. Verify lift gate weight capacity prior to shipment.
5. Secure rack to truck with logistics straps.
6. Chock casters

Root Causes: Product was not secured and was allowed to roll while on the lift gate. Lift gate may have sagged slightly causing machine to fall to the ground.
Lift Gate Failure

• Prohibit unpacking racks on the truck and prevent moving machines on the lift gate while in their unpackaged state resting only on its casters wherever feasible.

• Secure the rack to the truck or lift gate and/or block the casters to prevent lateral movement.

• If there are no proper pallets for the product, then secure the rack to the truck with straps or chock casters.

Root Causes: 1. Rack Product was incorrectly configured, 2. Rack was not secured, 3. Joystick error resulted in the lift gate platform tilting prematurely.
Other Tilt Stability Incidents

- Lost Control on a Ramp
- Fell Off Forklift
- Sag!
- Insufficient Weight Capacity of Lift Gate
Racks in the Common Carrier Environment

Typical “common carrier” environment
(cargo bars but no strapping locations)

Recommendation: Use only “Air Ride / Padded Van” type mover services for all Configured Racks!

Unauthorized Horizontal Placement!
Due to insufficient height of truck
**Improper Truck and Equipment Selection**

Exposed to Weather
**Improper Load Security**

📍 **Shipping Basics:** Where are the straps tying these to the walls?

📍 **Mistake:** Relying on neighboring freight to hold up products

📍 **Consequences:** Damage to rack product, nearby freight and vehicle
**Improper** Rack Product Handling: Manual Pallet Jacks

Do **NOT** use manual pallet jacks on steep slopes. Use powered handling equipment.

Too STEEP!

Maximum 5 degrees suggested (slope ratio 1:12) which is the same as the US ADA wheel chair standard.

Use ramps designed to US ADA standards where possible; movement on ramps above 5 degrees should be limited to the short pallet ramps.
Pre-Shipping Processes: Rack Configuration Rules
Rack Configuration Rules (for Transportation)

- Due to tilt stability, some products cannot be fully configured during shipment
  - Fully “configured” means totally full of hardware in all available slots

- Load hardware from the bottom up for greatest overall stability

- Do not leave empty slots between hardware or in first position (bottom)

- Load heaviest items first (in bottom) and then proceed up from there

- Loading hardware up to the 22U position is usually allowed. Check Manufacturer’s rules if intending to configure the rack in higher positions for shipping purposes. *Comment: Clients generally prefer fully configured racks but this must be affirmed to be safe for a given product.*

- Labels applied directly to the rack frame may provide additional guidance.

- Consequences of not adhering to proper rack configuration rules:
  - Product center of gravity may be too high or off geometric center
  - Product weight may be too much for manual handling off the pallet.
  - Product weight may be too much for standard elevators encountered during delivery
Rack Configuration Rules (for Transportation)

- **CAUTION:** Removing components from the upper positions in the rack cabinet improves rack stability during relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building:
  - Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet.
  - When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must do the following: – Remove all devices in the 22U position and above. – Ensure that the heaviest devices are installed in the bottom of the rack cabinet. – Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 22U level.
  - If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
  - Inspect the route that you plan to take to eliminate potential hazards.
  - Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
  - Ensure that all devices, shelves, drawers, doors, and cables are secure.
  - Ensure that the four leveling pads are raised to their highest position.
  - Ensure that there is no stabilizer bracket installed on the rack cabinet.
  - Do not use a facility ramp inclined at more than five degrees. Exceptions may apply for built-in pallet ramps.
  - Once the rack cabinet is in the new location, do the following: – Lower the four leveling pads. – Install stabilizer brackets on the rack cabinet. – If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
  - If a long distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also, lower the leveling pads to raise the casters off of the pallet and strap the rack cabinet to the pallet.
Proper Equipment and Procedures
Proper Truck and Equipment Selection

Many Places to secure logistics straps (GOOD!)
Proper Load Security for Rack Relocations

- Padded Van style vehicle, air ride suspension, etc.
- Product is fully blanket wrapped on all sides including top
- Corner guards are added outside of the blankets
- A minimum of 3 straps tie the product to the truck’s sidewalls
- Additional use of cargo bars to segregate freight
Load Security in the Vehicle

Rack secured to mast with straps

Corrugated package with edge protectors

Cargo bars and/or straps

Stiff corner boards

Blocking & Bracing

Rack not secured to the mast. Tips over around curves, bumps. Also impacts the load BEHIND the primary one being lifted.

Too Fast!

Do NOT lay down!

Excessive force bends frame

Tilt Indicator

Speed Limit 3.6km/hr (1.0m/sec)
Load Security in the Vehicle

Strap Method

Top View

Cargo Bars or Straps

Wood Crates Shown

Tilt Indicator

Crash!

No Securement!

Required regardless of distance!

Wood Crates Shown

or Straps

Top View

Cargo Bars

No Securement!
Use of Lift Gates

- Of most concern is the movement of an unpacked rack product (on casters) with a lift gate!

- Where possible, make deliveries to a raised dock facility so that lowering the product with a lift gate is not necessary.

- Lift gate must have weight capacity equal to product weight plus some safety factor to prevent sagging or tilting down of the lift gate under load of the product and handlers. Suggest 1800kg (4000 lbs.) minimum weight capacity for most server rack deliveries. Check actual equipment weight including movers. Refer to safety guidance provided by the lift gate equipment manufacturer.

- Hinged edge thresholds or caster chock features must be in the “UP” position where available (safer practice).

- When delivering a PACKAGED machine (palletized), the machine must remain packaged and palletized while on the lift gate. **Do NOT remove packaging (especially the pallet) while on the truck!!**

- Beware of the initial jolt or bouncing of the lift gate that can occur during initial lowering of the lift gate.

* Higher capacity may be needed depending on product weight
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Checklist item: Compare Product Weight to Lift Gate Capacity Label Before Loading

**New!**

![Image of a personloading a crate into a truck with a lift gate sign showing a maximum capacity of 4000 pounds.]

- **THE MAXIMUM CAPACITY OF THIS LIFT IS 4000 POUNDS**
- **WARNING**
  - Read this information carefully.
  - Improper operation of this liftgate can result in serious personal injury. Do not operate unless you have been properly instructed and have read, and are familiar with the operating instructions. If you do not have a copy of the instructions, please obtain one from your employer, distributor, or lessor before you attempt to operate liftgate.
  - Be certain that the vehicle is properly and securely docked before operation.

**New!**

![Image of a warning label on a truck showing a maximum load capacity of 5500 pounds.]

- **CAUTION**
  - Maximum Load Capacity: 5500 pounds.
  - Center load on platform to avoid risk of property damage.
  - Always stand clear of platform area.
Use of Lift Gates, Safer Practices

Lower the transition plate only on the ground

Chock the wheels to keep truck from moving

Additional Chains add strength and a partial boundary to prevent roll-off

Up
Use of Lift Gates, Safer Practices for Palletless Products

In Summary:

- Truck parked on a smooth, level surface, wheels chocked
- Lift Gate with adequate rated weight capacity (see next pg)
- Blankets, and Corner protection
- Security Strap tied to inside of truck!
- Caster chock in UP position
- Adequate “muscle” (3+ professional movers)*
- Cones to warn people to stay away from danger zone
- Sill plate to transition to ground

* Exact number as deemed necessary to ensure safety due to the weight and delivery environment for each situation

New Icon to Demonstrate Process
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Use of Lift Gates, Safer Practices

Verify adequate lift weight capacity! Recommend 1800-2500 kg or greater (4000 – 5500 lbs.) for configured rack server products. Check the capacity! Remember to include safety factor for the weight of up to 4 people that may be standing on the lift gate with the product.

Rack style products are continually getting larger and heavier!
Proper Use of Fork Lifts

- Another common cause of product instability is the movement of a rack product with a fork lift.
- Product should always remain packaged as long as possible including movement off the delivery truck and into the client’s facility.
- When on the fork lift, secure the product to the MAST of the forklift with logistics straps positioned as high as feasible for maximum leverage and control. Use blanket protection for any exposed surfaces of the machine.
- Avoid handling the product on the extreme tips of the forks. Product should be up against the mast of the fork lift.
- Lift the product as little as possible off the floor and then tilt the mast towards the driver for additional stability.
- Do not exceed 3.6 km per hour driving speed (2.2mph). Be especially slow when turning a corner! Above speeds assume a turning radius of 2meters or greater.
- Be aware of the load BEHIND the one you are lifting. Forks often spear the load behind causing puncture damages.
- Widen fork position as much as possible for stability.
- Do not use extra long forks to move two racks at once.
Final Delivery Preparations, Client Environment
Recommended Best Practice: Carrier Pre-Delivery Checklist (at Carrier Hub / WH)

☑ Handlers are trained and experienced to handle Rack Server Products
☑ External product inspection is done – machine is not already damaged.
☑ Check presence, condition and status of any tilt indicators used externally.

☑ Only authorized carriers are used. No inexperienced 1st, 2nd or 3rd tier carriers
  ☑ 2nd tier carriers are those that are subcontracted by the primary (1st tier) carrier hired by the shipper
  ☑ 3rd tier carriers would be those further subcontracted by 2nd tier carriers and so on.

☑ Lift gate, if used, is verified to have sufficient load lifting capacity for the product

☑ Products are secured to the walls of the truck with logistics straps, corners and blankets

☑ Sufficient trained personnel are on the truck to perform the final inside delivery.

☑ Initiate the 24 hour pre-delivery call to the client (this is a recommended best practice).
Carrier Pre-Delivery Call (CPC) Overview

Business focus:
- **Timeliness of customer delivery** has been identified as being key to improving customer satisfaction.
- **Customer notification of hardware deliveries** has been identified as one of the keys to improving customer satisfaction and ensuring that correct equipment is used for the delivery.

Solution:
- Improve customer satisfaction in regard to timeliness of delivery by systematic carrier pre call before delivery to customer.
- In order to inform customer, anticipate customer acceptance date and check the customer specific delivery requirements.
- Ensuring this new process can be measured from an operational perspective.

Benefits:
- Reporting structure for analysis and improvement
- Driving Revenue through increased Customer Satisfaction
- Client Satisfaction on:
  - Delivery Time Frame
  - Delivery Communications
  - All aspects of the delivery
Overview: Carrier Pre-Delivery Call (CPC)

**Pre Delivery Call Initiated**
- **When? (any of these)**
  - Day after ship
  - Customs Clearance
  - Arrival at carrier hub
  - 24-48 hours before delivery (typical)
- **By Who?**
  - The Carrier
  - Manufacturer

**Information Exchange w/ customers**
- **What?**
  - Call the customer to:
    - Notify impending delivery
    - Verify special delivery instructions
    - Agree on date and time
- **If Unsuccessful...**
  - Leave a voicemail
  - Try back later
  - Try to find missing or corrected contact info
  - Engage Manufacturer

**PreCall Completion Confirmation**
- **How?**
  - Send an electronic message communicating the result of the pre-call
    - Successful, appt date
    - Unsuccessful
      - Leave Message
      - No Answer
      - Wrong Details
      - Missing Details
  - Message flows to Manufacturer downstream systems

**Mfr Internal Measure and Monitoring**
- **Why?**
  - Customers want advanced notice of delivery
  - Carriers need to know delivery requirements
  - Drive issue resolution for missing and wrong contact details and delivery requirements back through fulfillment representatives
  - Drive efficiencies into delivery network
  - Delight the customer with successful, on-time delivery
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“Freight Shipped”

1. Product is shipped
2. Carrier is notified of tender
3. Customer Contact Information is provided

4. Carrier Calls Customer
   - Confirm Impending Delivery
   - Validate Delivery Instructions
   - Agree to Delivery Date

5. Carrier Sends CPC EDI Status to Manufacturer
   - For Measurement and performance monitoring

6. Carrier Coordinates End Customer Delivery

“CPC EDI (electronic notice) to Mfr”

“Delivery”

“Happy People”

Successful CPC

“Delivery goes smoothly

Customer is Delighted!!

Leads to…
Suggested Carrier Pre-Delivery Call Script

- All orders require a minimum of a 24 hour advanced pre call. During the pre call the customer service representative and the driver are to adhere to the following guidelines….

- Driver is to introduce themselves by name and company (if driver cannot make contact with manufacturer appointed end user they shall contact their dispatcher immediately)

- The driver is to explain what is being delivered and what shipping location the equipment originated from.

- The customer service representative and the driver is to review all delivery instructions noted on the Bill of Lading as well as those directed to him/her by their dispatcher.

- This information is to consist of:
  - Accessibility of tractor trailer (driver to specify length of tractor/trailer)
  - Specific delivery path in order to determine any specialized equipment that may be necessary
  - Confirmation of equipment’s final resting place. (Driver to confirm that equipment is going to be placed in final resting spot. If not then driver is to contact dispatch immediately)
  - The name of person that driver must contact upon arrival.
  - Any specific security requirements that driver must adhere to.

- Driver is to review all requirements and clarify any unclear information as well as set a 2 hour delivery window.
Carrier Final Delivery Checklist (at Client Facility)

☑ Verify with the client the route to be taken to perform the inside delivery.

☑ Walk the route from truck to installation location looking for obstructions, short thresholds, ramp angles, elevator capacities or other obstacles to safe handling.

☑ Install floor and door threshold coverings to protect product and property.

☑ Get more personnel if route and load weight are too much for safe delivery.

☑ Products remain packaged until inside the client facility.

☑ Ask client to inspect the status of any tilt indicators, then unpack the product.

☑ Ask client to inspect the physical condition of the product and sign shipping documents.

☑ Perform the “inside delivery” of the product to the final position requested by the client.

☑ If all is well, collect the packaging materials and take back to the truck

☑ Arrange for proper recycling / disposal of the packaging materials (not at client facility)
Product Handling in the Client Environment
Surface obstructions to be wary of

- Photos show reasons why it is important avoid movement of the product on its casters as much as possible, in particular in the environment between the delivery truck and the final installation location. There are many types of floor surface obstructions which can stop the casters possibly resulting in an unsafe situation.

- From top to bottom at right:
  - Bumpy sidewalk threshold for visually impaired.
  - Concrete expansion joint 38 – 50mm (1.5 to 2”)
  - Elevator threshold 25 – 38mm (1.0 to 1.5”)
  - Others: Brick, tile or other loose paver surfaces including gravel.
Facility Protections

A. Cardboard or blanket buffers on all door thresholds.
B. Steel Sill Plate (3mm) for bridging across gaps that can catch the casters.
C. Lexan, Plywood or Masonite carpet and floor protectors, taped to floor to prevent sliding.
D. Elevator Threshold
E. Tape
Placed directly on rack
New Rack Safety Icons (per ASTM D5445)

- Tilt Indicators
- Misc. Existing Symbols or Rack Warning Labels on Packaging

Current labels

- Center of Gravity
- Similar to ISO 780
Icon 1: Proper Fork Lift Handling

FUNCTION: To indicate the package shall be strapped/secured to the mast when using a forklift and may be tilted toward the mast for additional security.

REMARKS: Place on each side which is accessible to a forklift and at a height visible to the fork lift driver when approaching. May also be used as a prohibition mark if fork lifts should not be used.
Icon 2:  Top Heavy, Tip Over Hazard

FUNCTION:  To indicate that the package is top heavy and may tip over easily thus become a hazard.

REMARKS:  Place on all four sides

Key Design Objectives:
Show Hazard, Show Motion, No Words

Pre-Existing Versions
Either words are used or they don’t convey the key hazard message
Icon 3: Proper Lift Gate Procedure

**Key Design Objectives:**
Show Sequence, Show Motion of Lift Gate, Use No Words

**FUNCTION:** Secure the package to the truck while moving the lift gate. Also, chock the wheel tires to secure the truck during loading and unloading.

**REMARKS:** Place on at least two opposite sides of the package. The straps are connected to the inside of the truck and loosely wrapped around the machine to prevent it from falling away from the truck and onto the ground.
Icon 4: Do Not Lay Down Icon

Key Design Objectives:
ASTM D5445 Style, Use No Words,
Product Image is similar to real item

FUNCTION: To indicate that the product must be kept upright at all times. Do not lay the product down!

REMARKS: Place on all four sides of the package together with any other Intl. handling symbols.
Icon 5: Ramp Handling Safety Icon

FUNCTION: To indicate the importance of handling with 3 or more people while de-palletizing and manually handling the product.

REMARKS: Place on at least two opposite sides of package. Can be placed along with other unpacking instructions since it does not need to be visible to the fork lift driver while in the driver’s position.
Icon 6: Fork Lift Safety

**FUNCTION:** To indicate that the operator is to extend the fork tines to the widest position that will enter the pallet

**REMARKS:** Place on each face of the package that can be accessed by the fork lift in a position that is visible to a fork lift driver while driving.

Manufacturers may alter the design of the pallet in the icon to match the actual pallet being used for a given product to improve understanding.
Special or Unusual Delivery Situations

- The following occur on occasion and should be avoided if at all possible. However, there are times when these methods must be employed.

- In all cases, these must be done by specially trained RIGGER services that are familiar and experienced at these tasks.

  - Cranes
  - Window or Roof Deliveries
Rooftop Delivery of a Packaged Rack (Brazil)

- A crane is NOT the recommended method of handling a machine, but when it is required to use a crane, it must be done at maximum pre-cautions and only by trained rigging crews.
- In addition, precautions must be made for wind, rain, pedestrians, traffic etc.,
- The center of gravity should also be checked carefully for proper strapping position.
- Notice that the straps are criss-crossed so that all 4 sides of the crate are covered.
- Product remains completely in its crate (package) for this type of delivery/installation.
Use of a Crane on an Unpackaged Rack

- A crane is NOT the recommended method of handling a machine, but when it is required to use a crane, it must be done at maximum precautions and only by trained rigging crews.

- In addition, precautions must be made for wind, rain, pedestrians, traffic etc.,

**MATERIAL REQUIRED;**

(A) Wide Nylon or reinforced Fabric strap to lift with  
(B) Wood Frame to protect top cover from being bent  
(C) Blanket to protect painted surfaces from scratches  
(D) Wood Boards to protect bottom surfaces from bending

Use a “basket” if the covers cannot bear stress of straps (see next 2 pages) or remove the decorative covers first
Potential Problems with Crane Deliveries

Covers were damaged due to stress caused by the straps. Tip: Remove decorative covers or use a “basket” device (next page) to help protect the machine if the original packaging cannot remain in place.

Window was too small to keep the original packaging on the machine.
Improved Crane Delivery Practice (Basket Device)

Extreme measures are required in cases where the product is larger than the client’s facility can accommodate through normal doors and elevators.

“Basket” takes the stress of the lift. Blankets protect machine covers.
Field Relocations (Maintenance, Trade-Ins, or Lease Returns)

☑ In these situations, original factory packaging is usually not available. Therefore, additional precautions are necessary.

☑ Rack configuration rules are followed. Sometimes, no hardware above the 22U position. Will vary by manufacturer and product type. Labeling on the rack itself should guide.

☑ Product may be “asset sealed” with stretch wrap, corner boards and security seals.

☑ Product is shipped using “padded van” mover services which add additional blanket wraps and secure product to the walls of the truck.

☑ Only properly palletized and packaged products should be shipped via common carriers (LTL).
If Something Goes Wrong

- **Quick Communications:** Contact manufacturer’s representatives immediately so that they can inform the end clients.

- **Gather Observations:** Collect first hand observations from eye witnesses as to what happened and the root causes so that we can learn from the incident to prevent future incidents.

- **Take Photos!** Always take or request photos of the scene including close ups of damage or other contributing factors that can help determine the root cause.

- **Proper Perspective:** Until proven otherwise, all failures (damage incidents) are considered process or system failures first to which an engineered solution may be possible to minimize and help prevent “human error”.
Review: Summary of Safer Handling Practices

1. **Over the Road Truck Handling and Final Delivery**
   - Secure Product to the Sidewalls of the truck with logistics straps (3 or more) (see pg. 24-26)
   - Do NOT rely solely on neighboring freight to block products from moving
   - Keep product packaged until inside the client’s facility wherever possible
   - If packaging is not available, use straps and caster chocks to prevent roll-off from lift gates

2. **Fork Lift Handling**
   - Do NOT use fork lifts for handling unpackaged racks (on casters).
   - Widen forks to the widest position allowed by the base pallet
   - Don’t have the product out on the extreme tips of the forks
   - Always put product against the mast and then tilt the mast towards driver after lifting
   - Secure the product tightly to the mast of the forklift with straps to prevent tip over
   - Check Fork Lengths: Prevent damage to the load BEHIND the one being lifted
   - Drive slow. Especially when going around corners (Max Speed 3.6 km/hr. or 2.2mph).

3. **Pallet Jack Handling:**
   - Do NOT use manual pallet jacks on slopes when moving palletized products.

4. **Manual Handling of Unpacked Products (rolling on its own casters)**
   - Use enough people to ensure safety. Usually 3 or more depending on site situation.
   - Be wary of gaps which could block the casters and cause a sudden stop.
   - Use steel “sill plates” or “bridge plates” as needed to help bridge across gaps or obstructions
Summary – Wrap Up Slide

- Handling of our most critical and expensive products (RACKS) is a growing concern
  - Damage on high end systems is trending worse over time
  - We need your help on root cause analysis and executing 100% safe practices
  - These education materials should be reviewed and practiced by all who handle these products
  - We invite constructive feedback from experienced handlers to improve these educational materials.

- Business Trends: Clients prefer products that are fully configured prior to shipment
  - Therefore, products are continually getting taller and heavier, demanding extra care at each step
  - Shipments are expanding more into “International growth markets” with less experienced infrastructure

- Benchmarking partners (the Rack Transport Stability Team) are working toward an industry practice for product tilt stability for the transportation / relocation environment.
The Rack Transport Stability Team (RTST) thanks McCollister’s Transportation for their assistance in the creation of this training module.
The Rack Transport Stability Team

Thanks **YOU** for your attention and cooperation!