Rite-Hite Corporation

INTERNATIONAL
LOADING DOCK DESIGN

WE DO DOCKS RITE!
Who is Rite-Hite?

• Worlds Leading Manufacturer of Loading Dock and Industrial Door Safety Systems
• Founded in 1964
• Privately Held
• Headquartered in Milwaukee, WI, USA

• Mission Statement: Improve Safety, Security and Productivity Through Quality and Innovation
Designing the Material Transfer Zone
Index of Topics

• Shipping and Receiving – THERE IS A DIFFERENCE!
• How many docks do I need?
• Truck and Trailer Sizes?
• Access to dock and truck turning radius?
• Types of loading docks?
• Dock Leveler Size & Capacity?
• Dock Height?
• Trailer Restraints & Light Communication Systems?
• Door Size?
• Types of Dock Doors?
• Types of Dock Seals and Shelters?
• Dock Accessories – Chocks, Lights, Bumpers, etc.
• Miscellaneous dock problems & Solutions.
Shipping vs. Receiving

What’s the big deal????????

– Truck sizes
– Dock Height
– Door Size
– Material Handling Equipment
– Palletized vs. hand load
– Weights
– Volumes

• There is a very serious difference!
Shipping vs. Receiving

Low truck

High truck
Shipping vs. Receiving
Shipping vs. Receiving

Segregated dock heights
How many docks do I need?

Major Considerations:

Shipping vs. Receiving?
- Current needs
- Future needs

Do I have grade level access?
Do I have trash door?
Do I have adequate pedestrian access?
How many docks do I need?

Based on the busiest shift

If \( T \) = Number of trucks per shift

\( T \) = Hours per shift of dock operation

And \( U \) = Total Minutes each truck is in Truckwell

\( U \) = \( \frac{60 \text{ minutes}}{60 \text{ minutes}} \)

Then \( N \) = Number of dock positions required or \( N = T \times U \)

For instance, if 20 trucks per day use the standard docks at the receiving dock operating 8 hours per day which is \( T = \frac{20}{8} = 2.5 \), and each truck is in a dock for an average of 2 hours or \( U = \frac{120}{60} = 2 \), then \( T \times U \) or \( 2.5 \times 2 = 5 \) standard docks are required.

When in doubt, round up and plan for growth

- Provide for flexibility and future growth
How many docks do I need?

The concept of capped pits and knock out doors.
Types & Sizes of Trucks

• Small trucks
Types & Sizes of Trucks

• Large trucks and containers
• Types of trucks and trailers
  – Pup trailers
    • Bed heights: 1175mm – 1275mm
    • Lengths: 8.5m – 10m
    • Widths: 2400mm – 2600mm

  – Over the road dry trailers
    • Bed Heights: 1150mm – 1270
    • Lengths: 14.5m – 17.5m
    • Widths: 2400mm – 2600mm

  – Over the road ref. trailers
    • Bed Heights: 1200mm – 1350mm
    • Lengths: 14.5m – 17.5m Widths: 2400mm – 2600mm
Types and Sizes of Trucks

Rigid

- 12.5 m max
- 900-1100 mm

Refrigerated Pantec

- 19 m max
- 1300-1450 mm

Articulated Container & Flat Bed with Overhang

- 1350-1600 mm

Articulated Container & Flat Bed

- 900-1100 mm
- 1100-1300 mm

Articulated Pantec

- 900-1100 mm

Articulated B Double
## Types & Sizes of Trucks

<table>
<thead>
<tr>
<th>Type of Vehicle</th>
<th>Truck Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall Length</td>
</tr>
<tr>
<td>Rigid</td>
<td>12.5 m</td>
</tr>
<tr>
<td>Articulated Container &amp; Flat Bed</td>
<td>19 m</td>
</tr>
<tr>
<td>Refrigerated Pantec</td>
<td>19 m</td>
</tr>
<tr>
<td>Articulated Container &amp; Flat Bed with Overhang</td>
<td>19 m</td>
</tr>
<tr>
<td>Articulated</td>
<td>25 m</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Types & Sizes of Trucks

- Lift gates and special trucks
Types & Sizes of Trucks

- Lift gates and special trucks
Changing Trailer Environment

- **Air-Ride Suspensions**
  - Used on trailers for the last (15) years
  - Designed to provide Smooth Ride = Less Product Damage in Transit
  - Other Benefits:
    - Air-Ride on Cabs = Smooth Ride for Drivers
    - Smooth Ride For Cargo = Smooth Ride for Trailer Body, means less maintenance and longer trailer life
Changing Trailer Environment

- Air-ride suspensions
  - Challenge: air-ride suspensions can lower trailer bed height by as much as 150 – 200mm at the loading dock!

Air-ride suspensions can lead to vertical and horizontal trailer movement.
Do I have adequate access?

- **Apron space** - area from the face of the dock to the first obstruction (fence, building etc)
- The amount of space you will need depends upon many factors, including:
  - Size of trailers
  - Size of prime movers
  - Widths of berths and more

But here is a good “rule of thumb”

- Assume 3.6 metre centre lines (this is considered the minimum desirable)
- Then take the largest prime mover/trailer length that will be received and multiply this length by 2, then add 1.5 metres as a safety margin
- For each 150mm the centre line increases, reduce the total apron space 3%.
- For each 150mm the centre line decreases, add 3% more apron space.
Truck & Trailer turning radius

- MANOEUVRING SPACE
- LOADING AREA

*MANOEUVRING APRON SPACE

NARROW BERTH DOCKS

WIDE BERTH DOCKS
Truck and Trailer Turning Radius

Maneuvering apron space required for one maneuver into & out of position

<table>
<thead>
<tr>
<th>Overall Length of Vehicle</th>
<th>Width of Berth</th>
<th>Maneuvering Apron Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 m</td>
<td>3.0 m</td>
<td>26 m</td>
</tr>
<tr>
<td></td>
<td>3.6 m</td>
<td>25 m</td>
</tr>
<tr>
<td></td>
<td>4.3 m</td>
<td>24 m</td>
</tr>
<tr>
<td>14 m</td>
<td>3.0 m</td>
<td>29 m</td>
</tr>
<tr>
<td></td>
<td>3.6 m</td>
<td>28 m</td>
</tr>
<tr>
<td></td>
<td>4.3 m</td>
<td>27 m</td>
</tr>
<tr>
<td>19 m</td>
<td>3.0 m</td>
<td>41 m</td>
</tr>
<tr>
<td></td>
<td>3.6 m</td>
<td>40 m</td>
</tr>
<tr>
<td></td>
<td>4.3 m</td>
<td>39 m</td>
</tr>
<tr>
<td>25 m</td>
<td>3.0 m</td>
<td>54 m</td>
</tr>
<tr>
<td></td>
<td>3.6 m</td>
<td>53 m</td>
</tr>
<tr>
<td></td>
<td>4.3 m</td>
<td>52 m</td>
</tr>
</tbody>
</table>
Dock Approach

- Incline
- Level
- Decline
Dock Approach

- Incline
Dock Approach

- Level
Dock Approach

- Decline
Dock Approach

Example:

\[
\% \text{ Of Grade} = \frac{(R_1 - R_2)}{\text{Run} (R_3)}
\]
# Dock Approach

<table>
<thead>
<tr>
<th>% of Grade</th>
<th>Laminated Bumper Projection (mm)</th>
<th>Minimum Pit Projection (mm)</th>
<th>Total Projection (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>1%</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>2%</td>
<td>100</td>
<td>75</td>
<td>175</td>
</tr>
<tr>
<td>3%</td>
<td>100</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>4%</td>
<td>100</td>
<td>125</td>
<td>225</td>
</tr>
<tr>
<td>5%</td>
<td>100</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>6%</td>
<td>100</td>
<td>175</td>
<td>275</td>
</tr>
</tbody>
</table>
Types of Loading Docks

- Flush
- Cantelever
- Open Platform
- Free Standing Dock Ramp
- Saw tooth
- Dock House
- Finger Dock
Traditional Flush Dock
Traditional Cantelever Dock
Open Dock Platform
Free Standing Dock Ramp
Saw Tooth Dock
Dock House
Dock Leveler Types

- Pit Type
  - Mechanical
  - Air
  - Hydraulic
- Vertical
- Scissors Dock
- Sliding Lip
- Edge of Dock (EOD)
- Self Standing
Pit Style Dock Leveler - Mechanical
Pit Style Dock Leveler - Air
Pit Style Dock Leveler - Hydraulic
Scissors Dock
Sliding Lip Leveler (European)
Edge of Dock - EOD
Dock Leveler Lengths

- Dock/truck bed height differential \( \div \) leveler length = percentage of grade
Material Handling Equipment

- Electric pallet trucks
  7% max. grade

- Electric fork lift
  10% max. grade

- Gas lift truck
  15% max. grade
# Dock Leveler Length

<table>
<thead>
<tr>
<th>Dock Leveler</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
<th>450</th>
<th>500</th>
<th>550</th>
<th>600</th>
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<tbody>
<tr>
<td>EOD</td>
<td>6.1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RHH4706</td>
<td>2.6</td>
<td>5.3</td>
<td>8.0</td>
<td>10.7</td>
<td>13.3</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>RHH4708</td>
<td>2.0</td>
<td>4.0</td>
<td>6.1</td>
<td>8.1</td>
<td>10.1</td>
<td>12.1</td>
<td>14.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RHH4710</td>
<td>1.6</td>
<td>3.3</td>
<td>4.9</td>
<td>6.5</td>
<td>8.1</td>
<td>9.8</td>
<td></td>
<td>11.4</td>
<td>13.0</td>
<td>14.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RHH4712</td>
<td>1.4</td>
<td>2.7</td>
<td>4.1</td>
<td>5.4</td>
<td>6.8</td>
<td></td>
<td>8.2</td>
<td>9.5</td>
<td>10.9</td>
<td>12.2</td>
<td>13.6</td>
<td>14.9</td>
</tr>
<tr>
<td>RHH4714</td>
<td>1.2</td>
<td>2.3</td>
<td>3.5</td>
<td>4.6</td>
<td>5.8</td>
<td>7.0</td>
<td>8.2</td>
<td>9.3</td>
<td>10.5</td>
<td>11.6</td>
<td>12.8</td>
<td>14.0</td>
</tr>
</tbody>
</table>
Dock Leveler Width

Trailer Width
2340 mm

Standard Container

6’ (1830)

7’ (2135)

Full-width access leveler – 2600 mm
Dock Leveler lip length
Dock Leveler Capacity

- North America Standard Weight Standard (30K)

- North American DLIG Standard (C’)

- European Standard 6 ton
The Danger Zone

- 100,000 crossings per year
- Time pressure
- Heavy loads
- Fast moving equipment
- High accident potential
Void in the Floor
Safety

- Forklift Safety
  - Driving Off the Dock
  - Driving Through Dock Doors
  - Trailer-Dock Separation Accidents

Trailer creep

Trailer upending
Safety

Unscheduled Truck/Trailer Departure

Trailer Landing Gear Collapse
Safety

- Dok-Lok vehicle restraints help prevent all types of trailer separation accidents

Over 25 Years Proven Performance

More than 220,000 units installed

RHR-1000
Rotating Hook Restraint

VBR-500
Vertical Barrier Restraint

VBR-300
Vertical Barrier Restraint
Safety

• Light Communication System

Light Communication Kit
Establish a clear line of communication between drivers and dock personnel.

- 12 1/8" high x 6 3/16" wide x 2" deep (light cover projects 3 5/8")
- Clearly visible green and red lights
- Black polypropylene housing
- Two 12-volt automotive bulbs
- Inside toggle switch manually changes lights between green and red
- Middle switch position provides "red-red" safety condition
- One inside and two outside caution signs
- UL Listed

Optional LED Package
- Extended bulb life plus years
- Lower maintenance cost
- Cooler burning light system
- Less AMP draw
Controls

• Growing popularity of “powered” dock equipment
  – Controls and control sequencing have become even more important

• “Combination Control Boxes” with all control functions in 1 master control box are becoming standard

• Sequencing controls to ensure proper operation should be considered
Safety

- Chronic Forklift Operator Issues
  - Back and Neck Injuries Due to Transition From the Building Floor to the Trailer Bed
    - Unstabilized trailers can move in the vertical direction and cause “Trailer Drop” up to 8" with the weight of a forklift
    - Front and rear hinge design on traditional-style dock levelers create bumps and gaps, causing operator to experience vibration or “Dock Shock”
Dock Leveler Smooth Transition
Loading Dock Doors

- Lift Styles
- Insulated vs. Non-Insulated
- Steel Rite II
- Recommended Door Sizes
- Protection – Guardian Systems
Loading Dock Doors

- Lift Styles

<table>
<thead>
<tr>
<th>Type</th>
<th>Headroom</th>
<th>Side room</th>
<th>Depth Into Room</th>
<th>Center Line of Springs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Lift Manual</td>
<td>12'-21'</td>
<td>4'-0'</td>
<td>OH + 18'</td>
<td>OH + 24'</td>
</tr>
<tr>
<td>Standard Lift Motor Oper.</td>
<td>14'-33'</td>
<td>4'-0'</td>
<td>OH + 18'</td>
<td>OH + 66'</td>
</tr>
<tr>
<td>High Lift Manual</td>
<td>High Lift + 12'</td>
<td>4'-0'</td>
<td>OH + Lift + 30'</td>
<td>OH + Lift + 66'</td>
</tr>
<tr>
<td>High Lift Motor Oper.</td>
<td>High Lift + 12'</td>
<td>24'-0' One Side</td>
<td>OH + Lift + 30'</td>
<td>OH + Lift + 66'</td>
</tr>
<tr>
<td>Vertical Lift Manual</td>
<td>Door Height + 6'</td>
<td>4'-0'</td>
<td>18' (If door lift over 18, depth is 24')</td>
<td>OH + 2'</td>
</tr>
<tr>
<td>Vertical Lift Motor Oper.</td>
<td>Door Height + 6'</td>
<td>24'-0' One Side</td>
<td>18'</td>
<td>Does Not Apply</td>
</tr>
<tr>
<td>Low Headroom Manual</td>
<td>6'-0'</td>
<td>0'-0'</td>
<td>OH + 30'</td>
<td></td>
</tr>
<tr>
<td>Low Headroom Motor Oper.</td>
<td>9'-0'</td>
<td>13'-0'</td>
<td>OH + 78'</td>
<td></td>
</tr>
</tbody>
</table>
Loading Dock Doors

- Lift Styles – High Lift

INSUL-RITE™ Sectional Doors

HIGH LIFT SPECIFICATIONS

<table>
<thead>
<tr>
<th>ADDITIONAL CLEARANCE REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sideroom Required Manual</td>
</tr>
<tr>
<td>2&quot; Track</td>
</tr>
<tr>
<td>3&quot; Track</td>
</tr>
<tr>
<td>4½&quot;</td>
</tr>
<tr>
<td>5½&quot;</td>
</tr>
<tr>
<td>Sideroom Required Jackshaft Oper.</td>
</tr>
<tr>
<td>24&quot; One Side</td>
</tr>
<tr>
<td>24&quot; One Side</td>
</tr>
<tr>
<td>Centerline of Springs</td>
</tr>
<tr>
<td>OH* + Lift + 6½&quot;</td>
</tr>
<tr>
<td>OH + Lift + 7½&quot;</td>
</tr>
</tbody>
</table>

*OH — Opening Height
Loading Dock Doors

• Lift Styles – Standard Lift

INSUL-RITE™ Sectional Doors

STANDARD LIFT SPECIFICATIONS

<table>
<thead>
<tr>
<th>CLEARANCE REQUIREMENTS</th>
<th>2&quot; Track</th>
<th>3&quot; Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headroom Required Manual</td>
<td>14½&quot; - 20&quot;*</td>
<td>15½&quot; - 21&quot;*</td>
</tr>
<tr>
<td>Headroom Required Trolley Oper.</td>
<td>16&quot; - 22½&quot;*</td>
<td>18&quot; - 23½&quot;*</td>
</tr>
<tr>
<td>Sideroom Required</td>
<td>4½&quot;</td>
<td>5½&quot;</td>
</tr>
<tr>
<td>Depth into Room Manual</td>
<td>OH* + 18&quot;</td>
<td>OH + 24&quot;</td>
</tr>
<tr>
<td>Depth into Room Trolley Operator</td>
<td>OH + 66&quot;</td>
<td>OH + 66&quot;</td>
</tr>
<tr>
<td>Centerline of Springs</td>
<td>OH + 13&quot;</td>
<td>OH + 14&quot;</td>
</tr>
</tbody>
</table>

*Consult factory for exact measurement
**OH — Opening Height
Loading Dock Doors

- Lift Styles – Vertical Lift

INSUL-RITE™ Sectional Doors

**VERTICAL LIFT SPECIFICATIONS**

<table>
<thead>
<tr>
<th>SIDE CLEARANCE REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Operation</td>
</tr>
<tr>
<td>4½” (2” Track)</td>
</tr>
<tr>
<td>5½” (3” Track)</td>
</tr>
<tr>
<td>Motorized Operation</td>
</tr>
<tr>
<td>24” One Side</td>
</tr>
</tbody>
</table>
Loading Dock Doors

- Insulated vs. Non-Insulated
Loading Dock Doors

- **Steel Rite II – Impactable Dock Door**
  - The door that pays for itself after the first impact
  - Typical cost is ~$400 more than a standard sectional door
  - Typical cost of a replacement bottom panel on a standard sectional door is $300-$800
Dock Door - Protection
Enclosing the Dock Opening

- Why?
- Types of Enclosures
- Biggest Challenges
Why Enclose the Dock Opening?

- Temperature control
- Water infiltration
- Wind
- Dirt and debris
- Slippery surfaces
- Energy loss
- Insect infiltration
- Product damage or contamination
- Theft/security
- Employee comfort
Types of Enclosures

Dock Seals

Dock Shelters
Types of Enclosures

Dock Seals
- Compression Seal / “Gasket” Seal
  - Tightest sealing efficiency – Obstructed access

Dock Shelters
- Perimeter Seal / “Wiper” Seal
  - Full Access – Lower sealing efficiency
Dock Shelter Advantages

• Flexibility to fit larger door openings
• Able to accommodate larger variety of trailer sizes
• Provide full access – nothing protrudes into trailer opening
• But...
  – Can be damaged if struck by off-center trailer
  – Provide lower sealing efficiency if hinge gaps left unsealed
Dock Shelter Solutions

- Impactable side frames to resist damage from trailers
- Trailer-door hinge gap seals on shelter side curtains
Sealing the 4th Side

• PitMaster provides same environmental control benefits as seal or shelter is providing, on difficult-to-seal areas beneath and around the dock leveler.
Sealing Against Rain Runoff

- Weighted RainGuard header prevents water from infiltrating the loading dock off top of trailers

- Ordinary seal or shelter headers can’t stop flow of all water, especially on declining approaches
Accessories

- Heavy-Duty, Steel Faced, Dock Bumpers
- Heavy-Duty, Trailer Stands
- Flex Arm Dock Lights
- Dok-Guardian, Anti-Run Off Protection
We Are Available to Help

LOADING DOCK SAFETY SURVEY

LOADING DOCK LAYOUT REVIEW

ON-SITE TRAINING AND SUPPORT

FLY-IN PROGRAM