

LOADING DOCK

GUIDE TO DOCK DESIGN & CONSTRUCTION



A Division of Systems, LLC

DOCK PLANNING STANDARDS

PHASES

SITE DESIGN

LOADING DOCK DESIGN

EQUIPMENT SELECTION



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Introduction

The loading dock is essential to any business. As a vital part of prosperity, it should operate safely, efficiently, and dependably. After all, when a dock is shut down, so is the business.

That is why for over sixty years, McGuire a division of Systems LLC has been the leading one source manufacturer of quality loading dock equipment in the industry. Our customers know they can rely on McGuire dock equipment to be durable and dependable.

Planning a loading dock operation is an integral part of any facility's design process. This booklet contains valuable information about designing the dock area and specifying equipment for new construction and remodeling/retrofit applications. Developing plans for new dock equipment should be simplified with this reference material and assistance by local representatives from McGuire.



SITE DESIGN

Phase 1



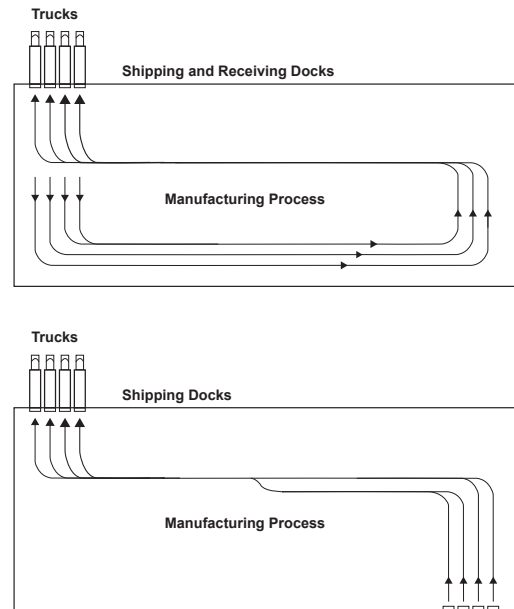
SITE DESIGN - PHASE 1

There are many types of loading dock designs, but not all are configured with efficient, logical, safe, and easy to access criteria. The loading dock is probably the busiest area of your building in terms of traffic. Forklifts, pallet jacks, and pedestrians must operate simultaneously around the dock area.

Efficiency is important to any business. Layout your dock area in a logical manner. Shipping and receiving combined for smaller spaces or separated to minimize movement of materials. The more traffic you create through poor design will mean less productivity and an unsafe area. Traffic patterns should be clearly laid out for operators. Two-way traffic is acceptable only where aisles are wide enough for vehicles to pass. Traffic patterns should be one-way and circular, or two-way when only one operator is running. A well designed traffic pattern will make loading/unloading operations smooth and quick.

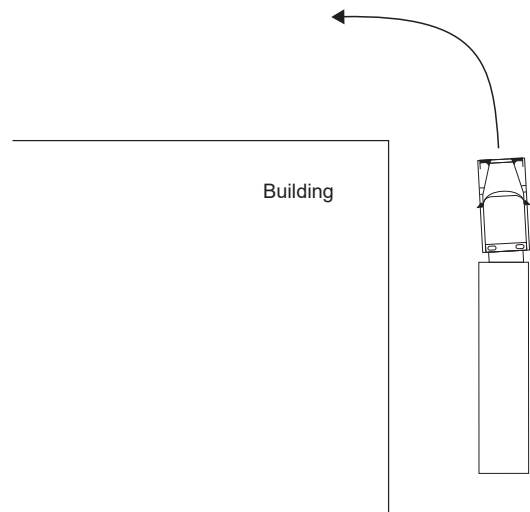
Dock Location

For optimum efficiency, shipping and receiving are often combined into one area. This makes the best use of personnel, equipment, and floor space. However, separate docking areas for shipping and receiving can be cost justified by volume as well as by methods of production where raw material is received at one end, and finished goods are shipped at the other. When planning dock locations, try to centralize material handling and storage in a convenient area with easy access to major in-plant users of incoming cargo. Also, keep in mind your workers' comfort level since the dock doors will be continuously opened.



Traffic Flow

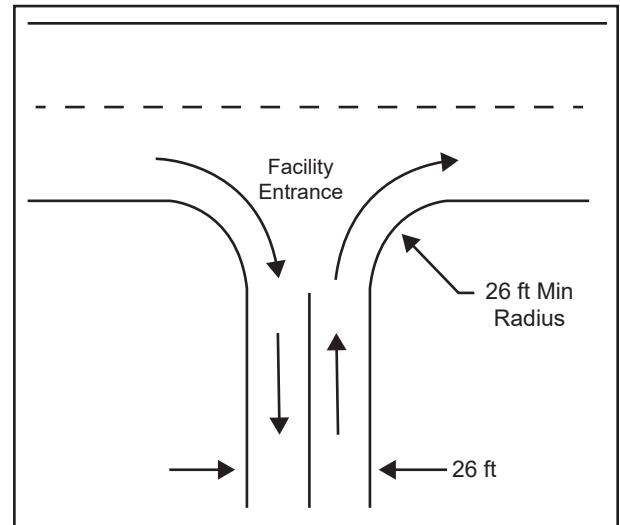
For the truck's best control, design traffic patterns around the building, so the truck driver is on the inside of each turn. Where traffic is on the right side of the road, and the driver sits on the truck cab's left side, truck traffic should be counter-clockwise around the building.



SITE DESIGN - PHASE 1

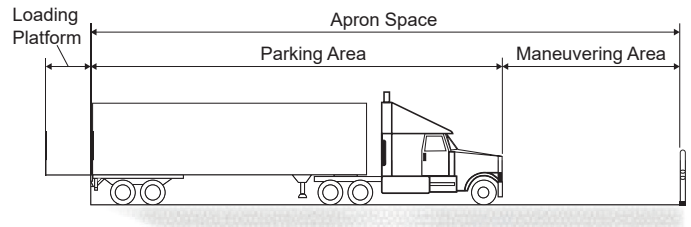
For efficient on-site truck traffic, include the following elements in your design:

- An entrance driveway that is large enough to handle the turning radius of the longest truck serving the site. For efficiency and safety, permit trucks to be driven forward onto plant property, rather than backed up.
- Right angle turns onto the site that has a minimum inside radius of 26' and a minimum outside radius of 50'.
- One-way access roads that are at least 13' wide and two-way roads that are at least 26' wide.
- Employee roadways that are separate from truck traffic.
- Truck waiting areas adjacent to the loading docks. Unless you design the loading docks for peak arrival traffic, the waiting area must accommodate all waiting trucks.



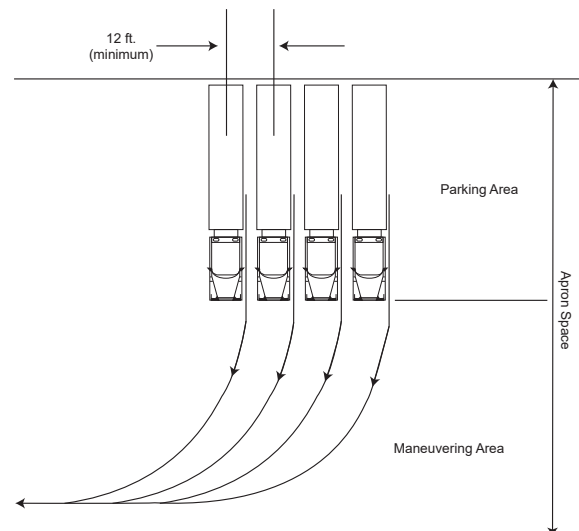
Apron Space

Apron space is the area in front of the dock. You will need sufficient space here for trucks to maneuver into place to back into the dock. Trucks tend to need more than twice their total length (truck + trailer) in order to straighten themselves. Add 5-6 feet as a safety margin plan for future trucks, which may be longer and wider.



The minimum apron space needed depends on the:

- Center line distances between the parked trucks at the dock.
- Length of the trucks (trailer and tractor)
- Steering geometry of the trucks.
- Generally the trailer length + tractor length, times 2, would be the recommended minimum based on a 12' (preferred 13' -14') center line.

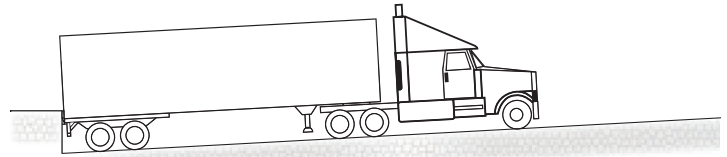


SITE DESIGN - PHASE 1

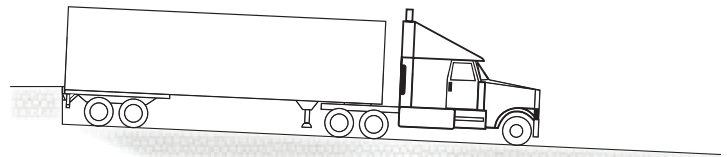
Dock Approach

The height of the loading dock to the vehicle will determine the maximum grade percentage. Ideally, this slope would be 6% or less. If heavy loads are expected, the slope should not exceed 5%. A steep slope can cause loads to topple and exacerbate trailer creep, in addition to trailer positioning in northern climates, so try never to exceed 10% and only for light loads. Greater than 6% inclines and declines can cause additional stress on material handling and loading dock equipment.

Proper drainage needs to be part of the design and should slope slightly away from the building.



Decline Dock Approach

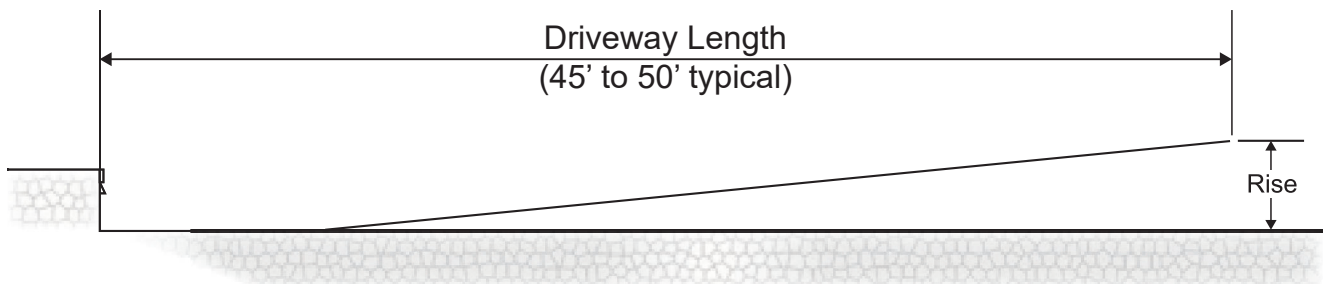


Incline Dock Approach

Calculating Slope Approach

The driveway approach grade, expressed in %, relates to the driveway's slope to the building wall. Grade percentage is computed using the formula: % of grade = (rise ÷ length) x 100%. "Rise" refers to the difference in elevation between the dock and a point (generally 45'-50') in front of the dock. "Length" refers to the actual distance on the driveway over which the rise is measured and is typically 45'-50' to match the average over-the-road trailer length. For every 1% of grade, there will be approximately a 1" difference from top to bottom between the trailer and building wall. This applies to incline as well as decline approaches. The percent of grade figure will be used to determine proper bumper projection and seal configuration.

$$\% \text{ of grade} = (\text{Rise} \div \text{Length}) \times 100\%$$



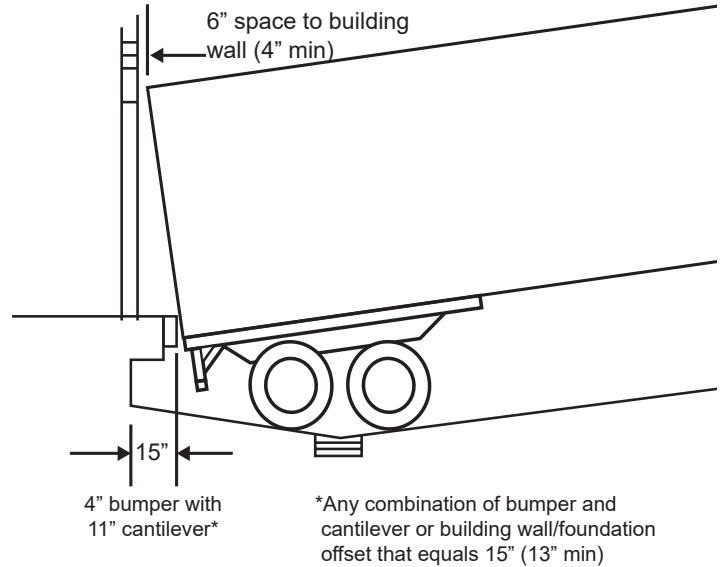
Bumper Projection

Bumper projection is the distance from the building wall to the front of the dock bumpers, and must include any foundation projection or dock cantilever.

Decline approach - building/bumper projection

Decline approach situations are particularly sensitive because inadequate projection or improper wall design can cause excessive product wear, product failure and/or building damage. This is because the trailer, after it is docked, will be 1" closer to the building wall at the top than at the bottom for every 1% of grade. Dock seals can suffer accelerated wear beginning at 1% of decline grade with a 4" minimum bumper projection.

Building/Bumper projection should be increased a minimum of 1" for every 1% of grade on a decline approach plus 2".



Pit Projection Guide for Decline Slope Driveways

Percentage of Grade = $\frac{\text{Rise of Driveway}}{\text{Driveway Length}}$

| % of Driveway Grade | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% |
|---|----|----|----|----|----|----|----|----|-----|-----|-----|
| Pit Projection *Excludes Bumper Projection | 0" | 3" | 4" | 5" | 6" | 7" | 8" | 9" | 10" | 11" | 12" |

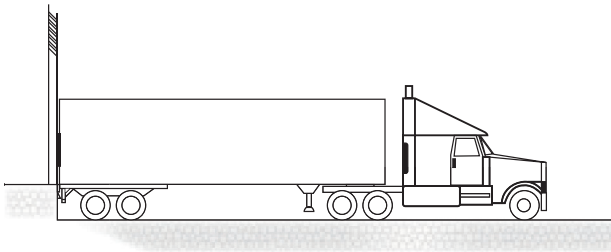
Note: Projection of pit may require modifications to seals/shelters and vehicle restraints. Coordinate with supplier if required.

Dock Configurations - Typical

The two most common types of dock configurations are the inside/outside dock and the open dock. When selecting which configuration to use there are six important factors that help determine which dock configuration to use: security, traffic control, safety, worker comfort, space availability and climate.

Inside/Outside Docks

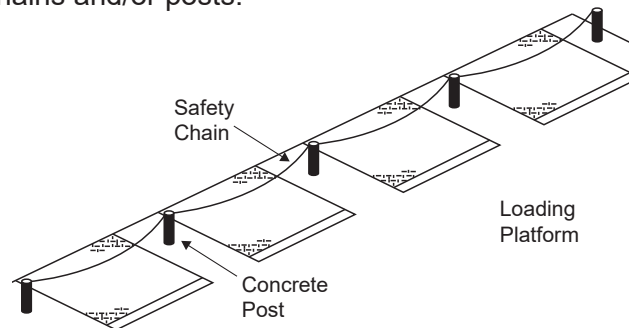
This is the most common dock design, in which the loading platform is inside and the trailer remains outside. Weather protection and security can be achieved with the proper door sealing system. The refrigerated dock is a common variation of the inside/outside dock.



Open Docks

This configuration is when the loading platform is on the outside of the building. Open docks are typically used in temperate climates. To add additional protection, a canopy can be added above the loading platforms.

Open docks require additional maneuvering space for forklifts between the building and the dock levelers. Additional safety equipment will be required to keep dock attendants safe, such as barriers, chains and/or posts.

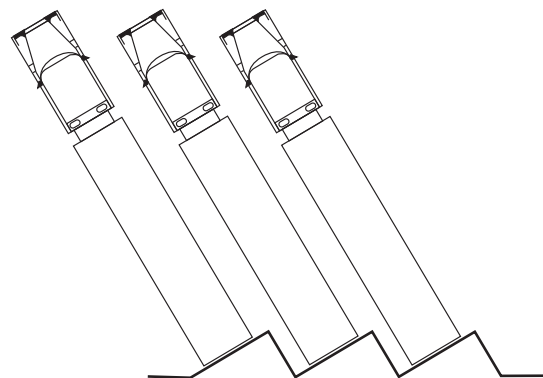


Other Dock Configurations

Limitations to building and property design may require other types of loading docks.

Saw Tooth Docks

Although staggered docks require less outside maneuvering space, they usually require much more building space and also reduce dock space. Traffic access must compensate for the angles of the docks.

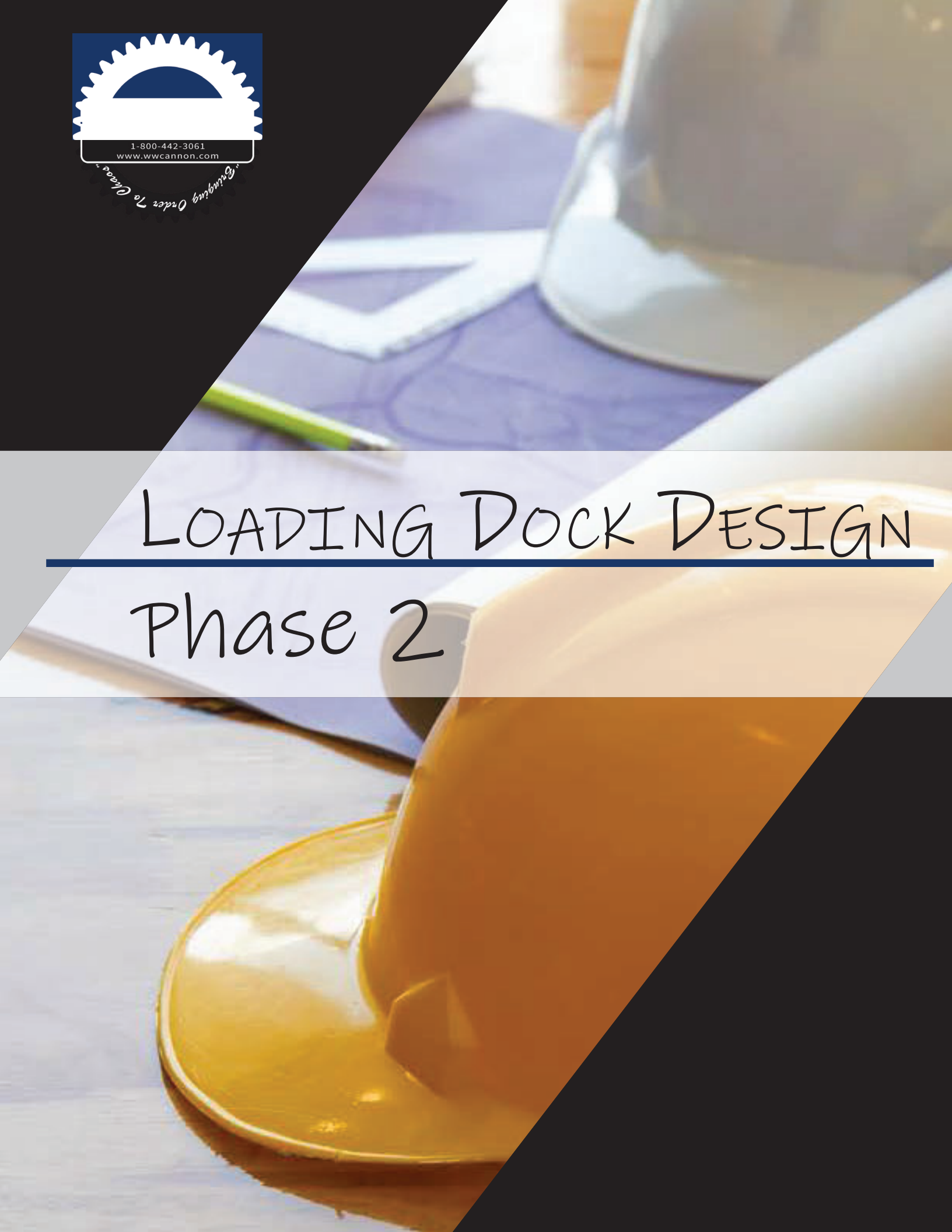




"Bringing Order To Chaos"

LOADING DOCK DESIGN

Phase 2



LOADING DOCK DESIGN - PHASE 2

The loading dock area is an important factor in the success of your business. Although efficiency is the key to selecting the best dock locations, you must also take safety into consideration. Proper planning and space management will reduce the chance of accidents and give both vehicles and pedestrians unobstructed access to the dock.

To begin planning for the loading docks in your facility you need to evaluate the:

- ***Truck configurations and number of trucks per day***
- ***Dimensions of loading docks and doors***
- ***Characteristics of the building processes***

Once these have been evaluated you can then consider the dock height, loading bay width, and the building interior layout adjacent to the docks.

Calculating Number of Dock Positions

To help determine the number of dock positions required you will need to know:

- Number of trucks being serviced
- Average time to load/unload each truck
- Timing of truck arrivals and departures

The formula below will help to determine the number of required dock positions. The example used services 48 trucks in an 8-hour period (6 trucks per hour) with an average load/unload time per truck of 45 minutes (0.75 hours).

Number of Trucks per Hour x Load/Unload Time per Truck = Number of Dock Positions

6 Trucks per Hour x 0.75 Hours = 4.5 Dock Positions

A dispatcher can control your shipping volume if you maintain your own delivery fleet, but common carriers normally deliver in the morning and pick up in the afternoon. If a bottleneck occurs during peak times, you may face an ongoing problem with detention charges. Therefore, you should figure the number of docks to be equal to the maximum number of trucks using the docks during peak hours to avoid costly delays. Take into account the material flow, volume of deliveries, time span of deliveries, time span of unloading and reassigning cargo, and the number of material handling units.

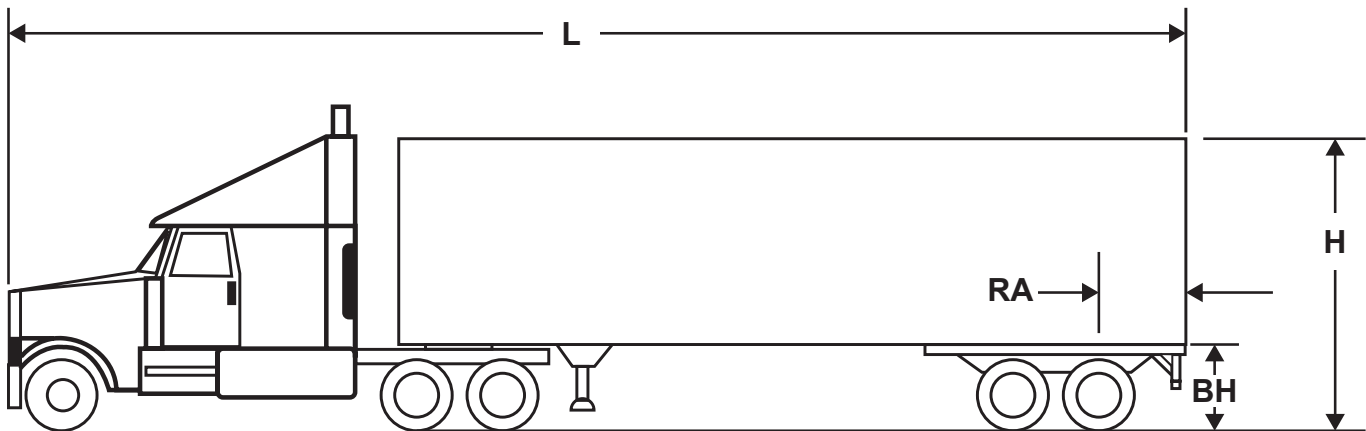
LOADING DOCK DESIGN - PHASE 2

Truck Configurations

Inevitably, your dock will encounter a special sized truck that differs significantly from the dock dimensions you have designed. Preplanning can help you combat the difficulty in servicing a special sized truck. Knowing the characteristics of the trailers that frequent your docks the most will determine the most appropriate design for the docks. The easiest solution for special sized trucks is to plan your last dock door to always service these trucks. However, with the wide range of trucks on the road it is vital to consider all variations.

| Type of Truck | Truck Dimensions | | | |
|-------------------|--------------------|-----------------|--------------------|-------------------|
| | Overall Length (L) | Bed Height (BH) | Overall Height (H) | Overall Width (W) |
| Container | 55'-70' | 52"-60" | 12'-13'6" | 96" |
| Semitrailer, City | 30'-35' | 44"-48" | 11'-13' | 96" |
| Straight Truck | 15'-35' | 36"-48" | 11'-12' | 96" |
| Refrigerated | 40'-55' | 50"-56" | 12'-13'6" | 96"-102" |
| Semitrailer, Road | 55'-70' | 48"-52" | 12'-13'6" | 96"-102" |
| Flatbed | 55'-70' | 48"-60" | - | 96"-102" |

**Liftgate trailers require additional consideration*

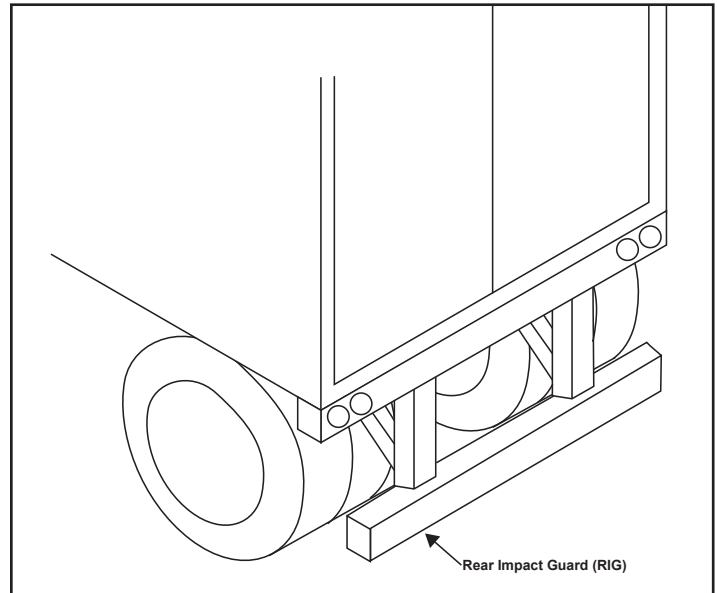


**RA - rear axle location*

LOADING DOCK DESIGN - PHASE 2

Under-ride Protection Bars

The under-ride protection bar, called the Rear Impact Guard (RIG) Bar is mounted at the rear of the trailer. The location and strength of the RIG allows for the specification of vehicle restraints to prevent a truck from driving away before loading/unloading is complete. The average RIG is 12"-22" above the drive.



Determining Dock Height

The most important design element of the loading dock is the height of the dock. The dock height should match the height of the docking trucks. The height difference between the dock and the trailer bed should be as small as possible. The dock leveler bridges some height difference, but the incline should not be too steep. A steep incline can cause the underside of the forklift to make contact with the dock leveler, and it increases maintenance demands on the equipment. To determine the dock height, find the midpoint of the bed heights of the expected trucks and increase the height 1"-3". Most trucks require a dock height of between 46" and 52".

The table shows dock heights that create level docks for common types of trucks.

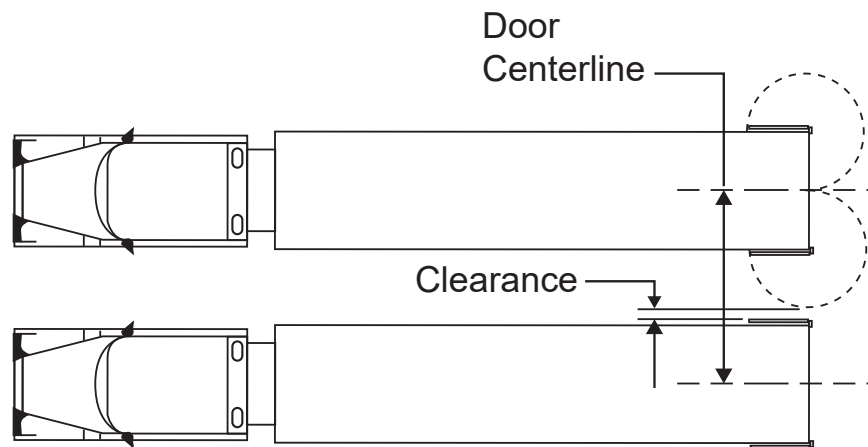
NOTE: Truck beds will raise and lower during loading and unloading. Decline or incline docks will alter trailer bed heights.

| Type of Truck | Dock Height |
|----------------|-------------|
| Container | 48"-54" |
| Semitrailer | 48"-54" |
| Straight Truck | 44"-48" |
| Refrigerated | 48"-54" |
| Flatbed | 48"-52" |
| High Cube | 32"-36" |

Determining Loading Bay Widths

The loading bay involves the physical layout of the dock levelers and dock doors. At a minimum, each door centerline should be 12' wide (14' recommended) to provide sufficient space for a truck, 8'0" to 8'6" wide, to back in squarely to the dock.

Bottlenecks should be avoided and the trucks should be able to move easily with the minimum amount of maneuvering so designing the width to be 14' wide will reduce congestion. Wider widths will allow for the trailer doors to swinging open or close at the dock and permit the mounting of rain downspouts, and/or two-way communication light systems and signs.



LOADING DOCK DESIGN - PHASE 2

Determining Door Sizes

Incorrectly sized doors can create logistic problems, reduced efficiency, and product damage, which is why selecting the proper door size is so integral when planning the loading dock. Consideration must be given to both the variety of trailers that will visit the dock and the loading method of the product. Planning now for possible future changes can save time, money, and frustration.

Common dock door dimensions are 8'-9' wide by 8'-10' high off finished floor.

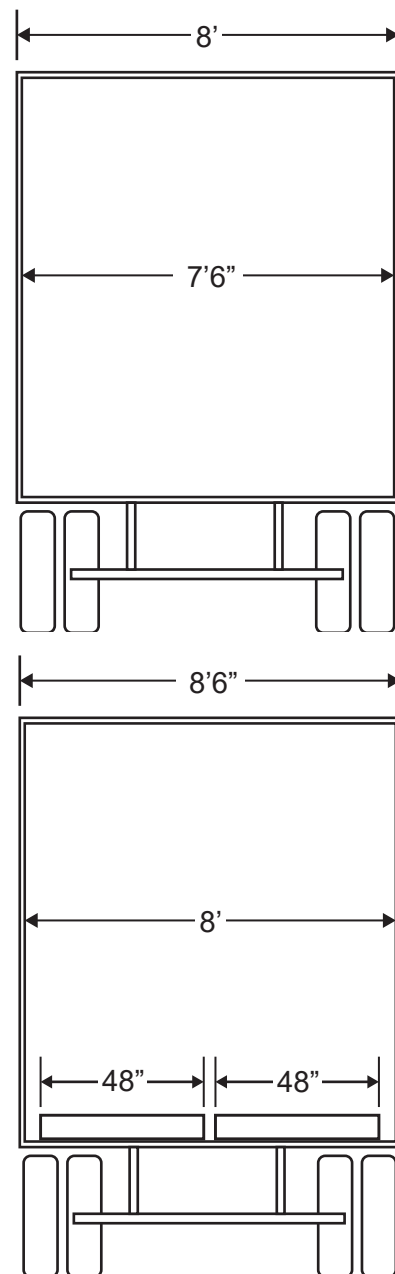
Powered doors reduce maintenance, injury, and increase efficiency and safety.

Determining Door Width

A majority of trucks on the road today are 8'6" wide. 8' width doors can service these trucks, but maneuverability is inhibited. Another concern of 8' door widths is off-center truck positioning, a truck being in the wrong position and needing to be moved will reduce your dock's efficiency.

9' wide doors are ideally used to service 8'6" wide trailers. Nine-foot wide doors also accommodate the unplanned servicing of many oversized loads. For special applications with oversized loads, a 10' wide door can be incorporated.

Wider doors require more space which can create a problem if space is limited, creating issues for mounting control panels, lights, conduit, etc if minimum centerlines aren't met. The maximum overall limits for trailer size are 8'6" wide x 13'6" high (differing in some states). With special permits, flatbed carriers are able to exceed the maximum width dimensions.



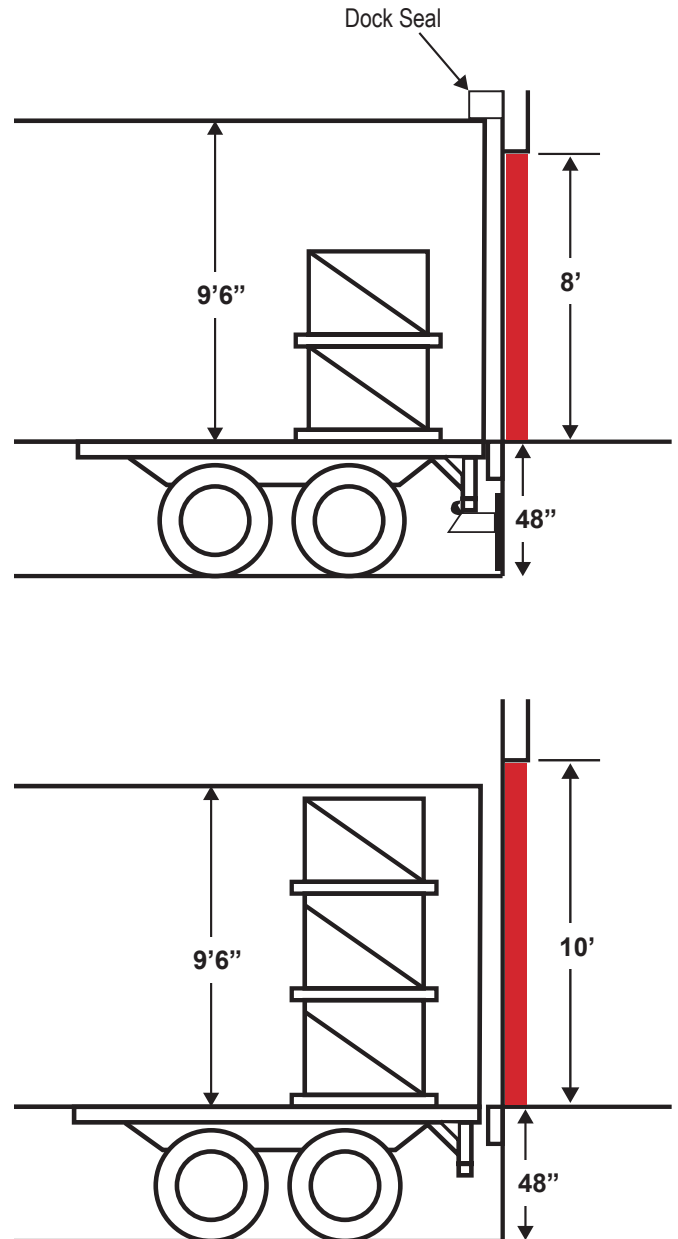
Determining Door Height

Depending on the application and height of the trailers serviced, there are three basic door heights. Understand that the common dock height is anywhere between 46"-52".

8' high doors (96") are applicable in many loading/unloading operations, but they do not facilitate full floor to ceiling product loading. This means it may not be possible to maximize the entire height of a trailer, leaving empty space that doesn't maximize freight costs.

10' high doors (120") permit floor to ceiling loading of products, as the product can easily pass under the door opening. The ten-foot height is a popular choice because of its versatility. This height will service the full range of loading/unloading operations including high cube trailers and high cube sea containers.

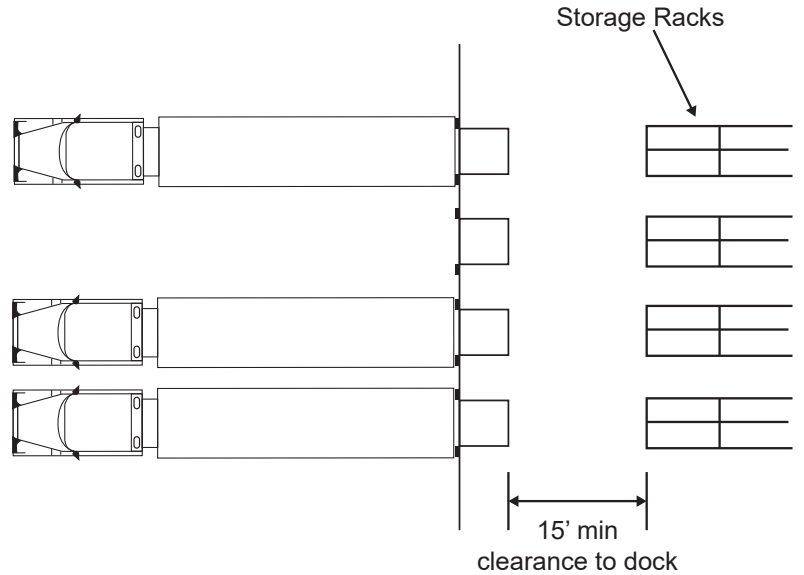
A dock shelter with a 10' high door provides the most unobstructed access into the rear of the trailer. Door sizes can be specified to any configuration, but just keep in mind product characteristics and the possibility that those may change. 8' high doors can still accommodate many loading operations where height is not critical to the product arrangement. 9'6" trailers provide improved space utilization and reduce the damage done to products.



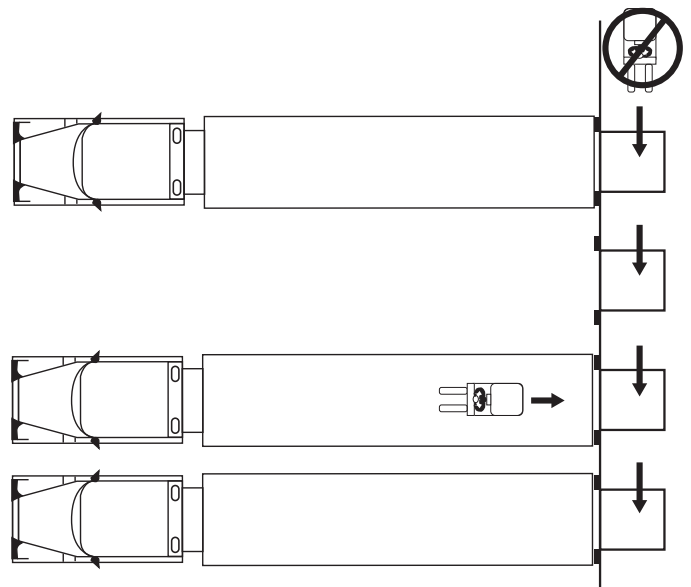
LOADING DOCK DESIGN - PHASE 2

Dock Interior Design

Providing a minimum of 15' behind the loading ramps for forklift traffic provides better visibility and permits forklifts to maneuver behind the loading docks and allows two-way traffic parallel to the dock face. The larger the aisle width allows forklift operators to drive straight onto the dock levelers, which reduces stress on the equipment and improves safety.



Adding restrictions that deter forklift drivers from driving parallel to the dock face will minimize collisions with forklift drivers backing out of their trailer.





EQUIPMENT SELECTION

Phase 3



EQUIPMENT SELECTION - PHASE 3

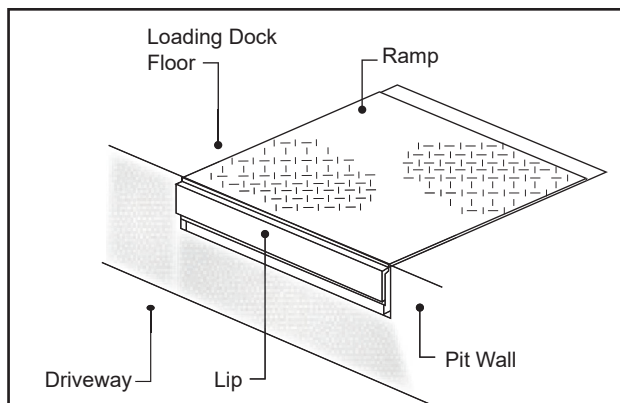
Dock Leveler Selection

Loading dock levelers bridge the gap between the inside of the building and the semi-trailer. During loading and unloading the leveler must be able to compensate for the up and down movement of the trailer. It must also be able to support extremely heavy loads, and service a wide range of trailers. A dock leveler includes a ramp which is hinged along its rear edge and a lip that is hinged at the front of the ramp. Dock levelers use similar operations where the ramp is raised, the lip swings out and once the lip is extended the ramp will lower on to the bed of the truck.

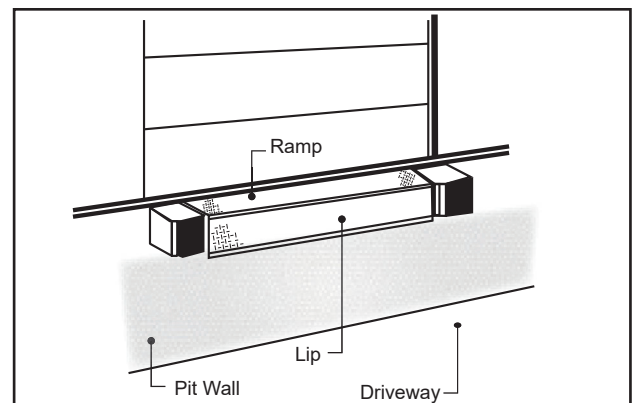
The two most common levelers are:

- **Recessed dock leveler (pit style)** - installed into a pit that is formed in the loading platform
- **Edge-of-dock leveler** - installed onto the curb face of the loading platform

Recessed dock leveler (pit style)



Edge-of-dock leveler



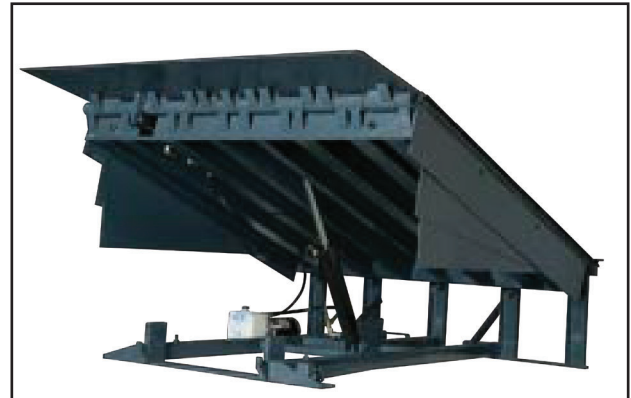
Pit Style Dock Levelers

Pit style dock levelers are the most common type of dock leveler and provide the greatest service range of 12" above dock and 12" below dock. These dock levelers are commonly installed into pits that are formed into the concrete during construction. The pits are sized to meet the specification of the dock leveler being installed. All levelers are manufactured to industry standard sizes and capacities (based on ANSI MH30.1).

Pit style levelers are available with either spring-loaded mechanical operation or powered push-button operation. Push-button levelers are activated by either air or hydraulic system, allowing for an easier and safer operation. Mechanical levelers offer an upfront low cost option but a small initial investment in a push-button leveler upgrade will be returned several times over in the cost savings on maintenance. Mechanical levelers require more maintenance especially in high-usage applications and don't carry the same safety options as push-button levelers.

Hydraulic Dock Levelers

Premium hydraulic dock levelers from McGuire feature in-line velocity fuses and a clean-frame design for easy, unobstructed cleaning of the pit. Velocity fuses are a “Fail Safe” system that automatically locks the deck in case of unexpected truck departure. Hydraulic levelers also come standard with a NEMA 4X or NEMA 12, UL Listed, push-button control panel for easy operation. Hydraulic levelers carry the highest capacity rating and lowest cost of ownership.



Air-Powered Dock Levelers

McGuire air-powered dock levelers are an economical alternative to hydraulic levelers but are still operated with a push-button activation. An air bag or bellows system is used to raise and lower the deck. With the option of an air bellows and compressed air, an electrical infrastructure is not needed in the dock pit. All McGuire dock levelers are built with a structural steel frame for added strength and durability.



Mechanical Dock Levelers

McGuire manufactures a high-quality line of mechanical dock levelers. These levelers are structurally sound and provide years of dependable service. These cost-effective levelers include all of the same advanced construction features as hydraulic or air-powered models. Mechanical levelers are manually operated by pulling the chain at the rear of the leveler. The deck raises and the lip extends automatically. The weight of the attendant is all that is required to lower the deck and lip onto the trailer bed.

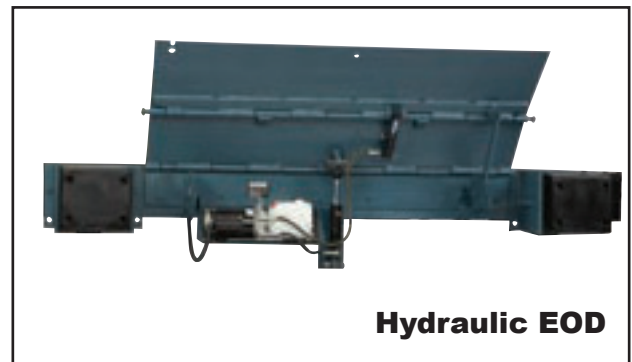
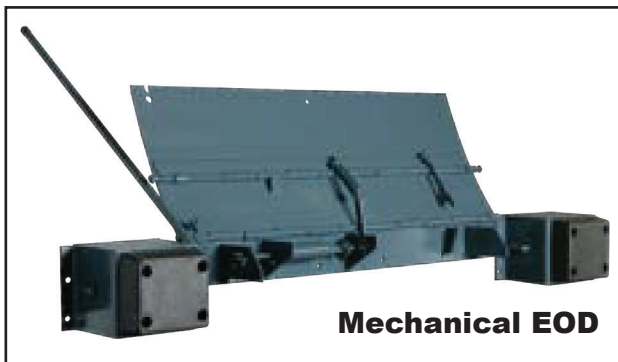


EQUIPMENT SELECTION - PHASE 3

Edge-of-Dock Levelers

The Edge-of-Dock (EOD) leveler is a low cost alternative best suited for applications with little variation in truck bed and dock height. The shorter ramp restricts the EOD to a service range of 3-5" above dock and 3-5" below dock.

There are two styles of EODs available; manual or push-button operation. McGuire's lift-free mechanical model is the easiest to use mechanical leveler in the industry. The simple two-step operation of the operating handle helps eliminate personnel injuries and physical exertion. The hydraulic model features a push-button control panel for easy operation. Both style levelers are mounted to the face of the dock, eliminating the need to construct or break out a pit.



Special Application Levelers

McGuire manufactures special application levelers to fit different types of dock operations. Vertical storing hydraulic levelers are unique in that they can be stored completely inside the exterior door. Vertical levelers are ideal where high security or sanitation codes must be met. The pit of the leveler can be completely hosed or swept without obstruction. Maintenance or adjustments can be made safely and unobstructed. The levelers are normally used in cold storage, food or pharmaceutical industries, where dirt and debris infiltration are a concern. Usually packaged with an under-leveler seal, vertical levelers feature the same structural integrity as McGuire's pit type hydraulic levelers.

The hydraulic Rail Ramp is designed exclusively for use with rail dock loading and unloading situations. The high strength Rail Ramp is mounted outside the building and can be set in a track for alignment with the railcar.



Vertical Storing Dock Levelers

Environmentally Friendly

Vertical Storing (VS) dock levelers from McGuire store in the vertical position as the name suggests, allowing the door to form a perfect seal to the pit floor. Compared to “pit style” levelers, which can radiate expensive conditioned air to the outside of the building in the stored position, vertical storing levelers can produce savings equivalent to one ton of refrigeration in the stored position alone. A variety of deck, pit and face mounted draft seals can produce even greater savings, reducing energy loss while the vertical leveler is in use.

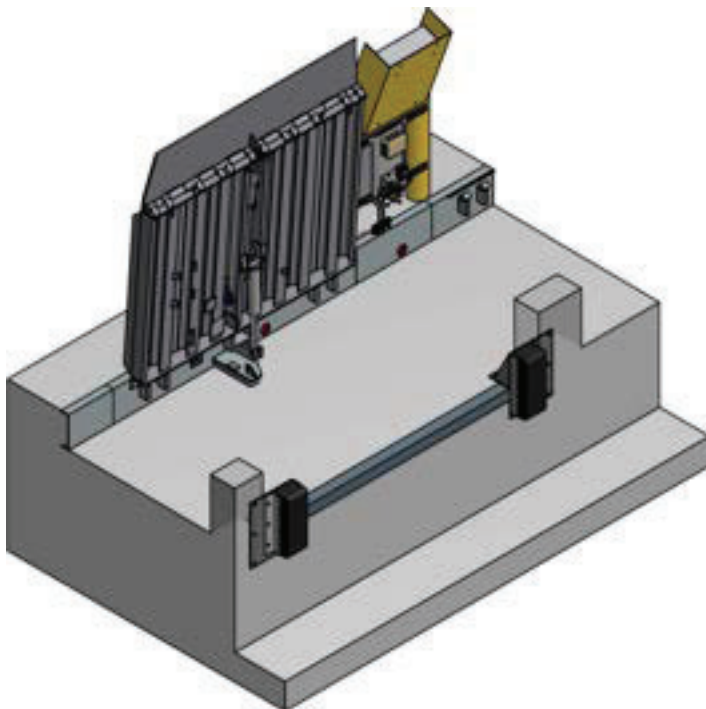
Cleanliness

Highly regulated industries such as the food industry, choose VS series levelers for cleanliness improvements in the dock area. Access for cleaning, overall visibility, and rodent control is a notable improvement over conventional “pit style” levelers.

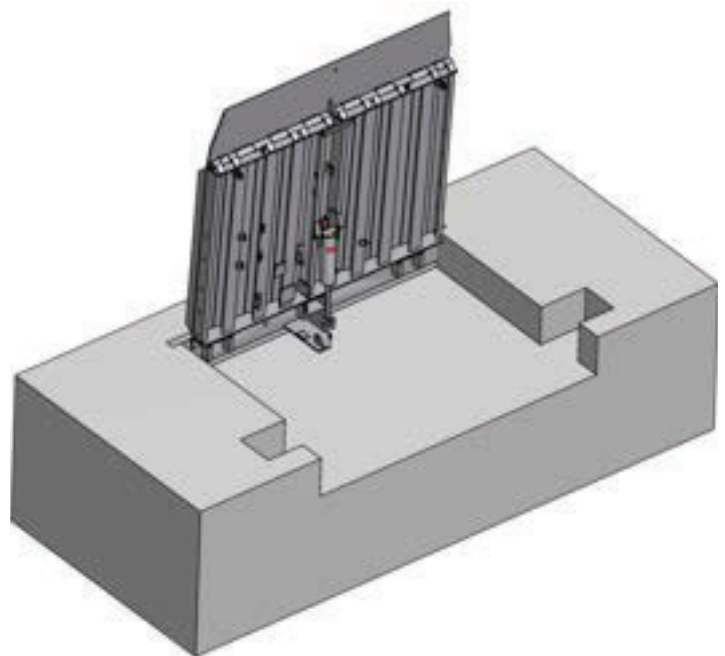
Continuous Pit vs Individual Pits

A continuous pit is more economical to construct and permits easy access for house keeping. Individual pits can be formed by notching around door jambs to allow the door to close firmly to pit floor, creating room for staging between pits.

Continuous Pit



Individual Pit

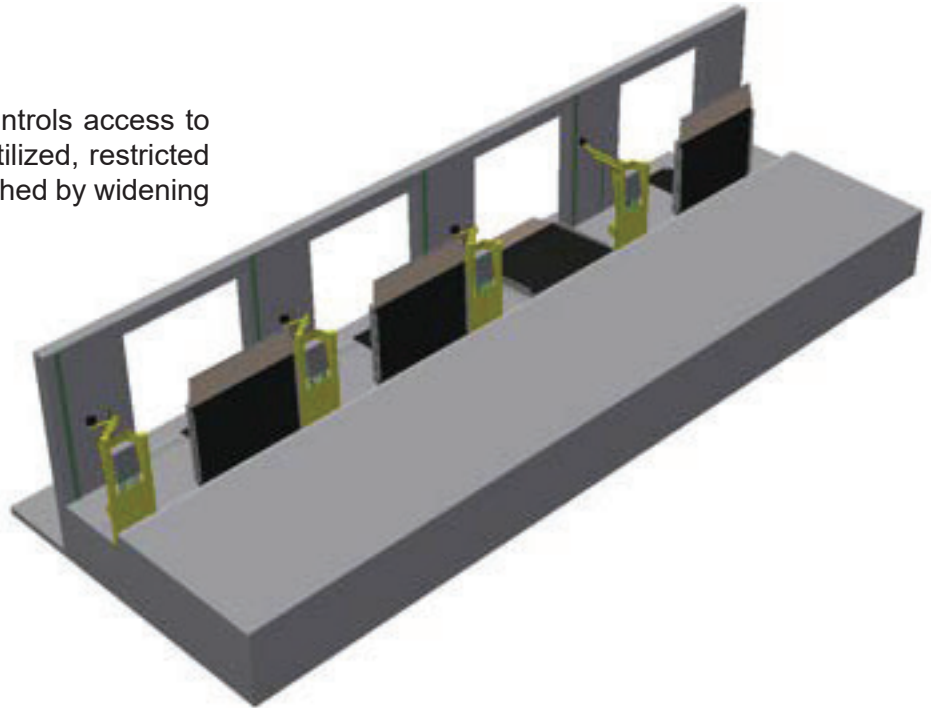


EQUIPMENT SELECTION - PHASE 3

Vertical Storing Dock Levelers

Control Stanchions

Proper stanchion and railing design controls access to the pit area. Where power doors are utilized, restricted access to the pit area can be accomplished by widening stanchions and railings.



Environmental and Security Control

The VS leveler is ideal for opening trailer doors into the building, as well as allowing the overhead door to seal along the pit floor when closed, a desirable application consideration for enhanced environmental and security control. This also allows for a secure chain of custody during the loading process.

| | Typical Dimensions | Recommended Dimensions for Trailer Doors Opening Inside the Building |
|------------------|--------------------|--|
| Door Centerlines | 11'-13' | 11'-13' |
| Door Opening | 8'-10' | 10' |
| Pit Depth | 10', 12' or 15' | 12" or 15" |

Hydraulic Options from McGuire

Leveler only

- Deck Mounted
- Remote Mounted – back side of the stanchion

Leveler and Restraint Combo

- Remote Mounted – back side of the stanchion

Specifying the Correct Dock Leveler

With the wider range of operation, a pit style dock leveler is always the best choice to accommodate a wide range of trailer bed heights. Edge-of-Dock levelers should only be used if the facility operates with a narrow range of trailer bed heights.

Dock levelers have long lives, and significantly contribute to the facility's efficiency. It is very important to provide accurate specifications for the following dock leveler characteristics:

- Length
- Width
- Lip projection
- Load capacity
- Activation system
- Environmental capability

Length

The dock leveler slope is determined by the height difference between the truck bed and dock height along with the length of the dock leveler. The slope must be less than the maximum grade capability of the loading equipment. The maximum height differential between the loading platform and the expected truck beds will determine the required length of the dock leveler.

The table shown to the right represents the minimum lengths required to keep the ramp slope within the capability of the loading equipment.

Dock levelers typically come in lengths from 5 to 12 ft with the most popular length being 8 ft, which is suitable for most applications.

Width

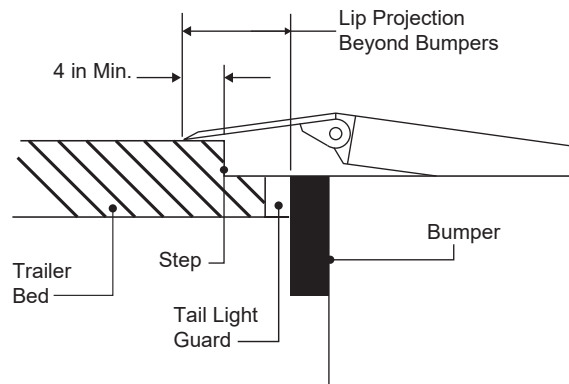
Dock levelers are available with standard widths of 6 ft, 6½ ft, and 7 ft, with the most common size being 6 ft. It suits most applications, however 7 ft widths are recommended if below dock endloading is common.

| Height Difference Between Truck Bed and Dock | Loading Equipment | | | |
|--|-------------------|----------------------|-------------------|----------------|
| | Hand Pallet Jack | Electric Pallet Jack | Electric Forklift | Gas Fork Truck |
| 2 in | 5 ft | 27 in | 27 in | 27 in |
| 4 in | 12 ft | 5 ft | 30 in | 27 in |
| 6 in | - | 8 ft | 5 ft | 30 in |
| 8 in | - | 10 ft | 6 ft | 5 ft |
| 10 in | - | 12 ft | 8 ft | 6 ft |
| 12 in | - | - | 10 ft | 8 ft |
| 14 in | - | - | 12ft | 10 ft |
| 16 in | - | - | - | 10 ft |
| 18 in | - | - | - | 12 ft |

EQUIPMENT SELECTION - PHASE 3

Lip Projection

Per ANSI MH30.1 the dock leveler lip must extend at least 4" into the truck bed. A typical lip is 16", which projects less than 12" in front of the dock bumpers. Longer lips may need to be specified for special rear step and rear door configurations on some trailers. The step of a refrigerated trailer may require an 18" or 20" lip projection.



Load Capacity

Correctly choosing the load capacity for a dock leveler can extend the dock leveler's life. The load capacity of the dock leveler is dependent upon the gross vehicle weight (GVW) of the forklift.

GVW = weight of forklift + weight of max. load

Load capacity = GVW x 2.5 (complexity factor)

GVW Example:

12,000 lb + 5,000 lb = 17,000 lb x 2.5 = 42,500 lb

Round up to next highest capacity

Complexity Factors that will Contribute to Increased Capacity

- Each dock position will service more than eight trucks per day
- Forklifts do not drive onto the dock leveler straight
- Three-wheel forklifts will be used
- Speed of forklift is expected to exceed 5 mph
- There are attachments on the front end of the forklift or fork side shifters
- Percentage of operating grade consistently exceeds 7% grade
- Majority of loading is below dock level

Activation System

The most ergonomic and safest type of dock leveler activation system is a push-button. Push-button operation requires less maintenance, repair and overall lower cost of ownership.

Environmental Capability

On inside/outside docks at temperature controlled facilities, the use of perimeter weather seals is recommended to help prevent outside air from infiltrating the building.

The use of expanded foam is recommended in refrigerated facilities, to help prevent the warmer outside air from condensing on the underside of the ramp. Condensation on the underside of the ramp causes corrosion and structural problems. The insulation also minimizes the loss of refrigerated air.

Benefits of Hydraulic and Air Powered Dock Levelers OVER Mechanical Dock Levelers

When deciding between specifying mechanical or push-button dock levelers, consider the following: Hydraulic and air powered levelers require less maintenance than mechanical models. They generally have a longer life span and are easier to operate. Equipping your docks with push-button activated levelers can also limit workplace accidents.

Air powered levelers are ergonomically correct, and their push-button activation saves time and keeps dock personnel from having to walk down the mechanical leveler.

All hydraulic levelers from McGuire feature an in-line velocity fuse "Fail-Safe" system, which locks the deck in position (1" to 3" drop) if the truck departs from the loading dock prematurely. Safety is an essential factor. Hydraulic levelers operate via a control panel mounted near the leveler on a wall. The simple push-button design raises and lowers the leveler without any physical exertion by the dock attendant, reducing injury risk.

Mechanical levelers require the attendant to pull the release ring and walk down the leveler into position. Although not considered strenuous activity, it does put the attendant near or on the leveler platform during operation. Since mechanical dock levelers are upward biased, they are under the most stress in the stored position. Hydraulic and air powered levelers log fewer hours because they are only working while the dock attendant is pushing the raise button. Additionally, hydraulic dock levelers can accommodate higher load capacities, up to 120,000 lbs instead of the 50,000 lbs capacity of a top mechanical leveler.

Bumpers

Bumpers protect the building and can absorb 90-95% of the impact from a backing truck. They also provide protection to the building during loading/unloading. As the truck floats up and down. Bumpers affect the dock leveler lip purchase, as well as the seal and shelter projection due to limiting how close the truck can park to the dock.

Bumpers are typically available as molded or laminated rubber with a standard thickness of 4"-6". Steel face bumpers are used for increased life.

EQUIPMENT SELECTION - PHASE 3

Vehicle Restraint Selection

A leading cause of dock accidents is due to the truck moving away from the dock prematurely causing the forklift and its driver to fall from the dock. This can happen in several ways:

- 1) the truck driver pulls away unexpectedly
- 2) the impact of the forklift causes the trailer to move forward (trailer creep)
- 3) the landing gear on a detached trailer collapses due to forklift impact and the trailer moves forward.

You can help prevent many of these accidents with the installation of vehicle restraints from McGuire. Your restraints will help prevent separation of the trailer from the dock during the loading/unloading process so your personnel can safely do their job. A clear visual communication light system alerts both driver and dock attendants as to the status of the restraint.

McGuire offers a complete line of push-button and mechanical restraints to help improve safety at your loading dock area. Additionally, the push-button restraints come standard with iDock® Controls. These technologically advanced controls provide an efficient interface with membrane dome button technology for ease of use and an interactive message display for valuable equipment usage, sequence instructions, notifications, and other information. iDock Controls also have a 3-color light communication combined into one large LED light assembly to clearly indicate the conditions of the dock.

Types of Vehicle Restraints

Vehicle restraints are available in two designs, rear impact guard (RIG) dependent and wheel engaging.

Rear Impact Guard (RIG)

This is by far the most common type of vehicle restraint in the industry since most over the road trailers are required to have a RIG. RIG dependent restraints are designed to hold or block a trailer's Rear Impact Guard to keep the trailer secured to the dock. They are available in either push-button or manual activation.

Wheel Engaging

Wheel engaging restraints focus on restraining the wheels of the trailer. This type of restraint is typically used when trailers do not have a RIG and cannot be restrained. Trailers with hydraulic lift gates, tandem hitches, and damaged RIGs can be captured and restrained by either a powered wheel engaging restraint or manual wheel chock.

OSHA requires at a minimum the use of wheel chocks to restrain trailers at loading docks. Unfortunately, wheel chocks are used infrequently and often improperly. Even when used properly, wheel chocks are not always effective at keeping a trailer at the dock. Sand, dirt, gravel, or precipitation of any kind can prevent wheel chocks from staying in place. A truck driver in a hurry can often pull a trailer right over the wheel chock and away from the dock.

A safer alternative are vehicle restraints, which satisfy the OSHA requirement and are far more effective than wheel chocks.

Non-Impact Vertical Barrier

McGuire offers a non-impact vertical barrier with push-button or manual operation. These restraints provide a low profile, non-impact design and can be mounted to the dock wall or the drive approach. They are a reliable and economical solution to help prevent unexpected trailer departure from the loading dock during loading/unloading.



Trailer-Positioned Rotating Hook

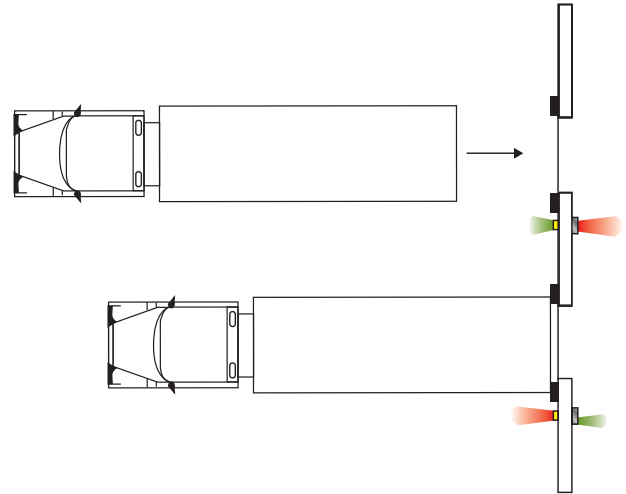
McGuire offers two styles of trailer-positioned rotating hook restraints. The TPR is a trailer-positioned restraint that automatically adjusts to the height of a trailer's RIG and uses a rotating steel hook to secure the trailer to the dock during loading/unloading. The UniLock is the only trailer-positioned rotating hook restraint that can automatically release "RIG Wedge" pressure, eliminating the need for the truck to reverse to release the restraint. Both units have push-button activation and mount to the dock wall.



EQUIPMENT SELECTION - PHASE 3

Light Communication

A light communication package can stand alone, be combined with a simple wheel chock or integrated with a vehicle restraint system. A common system would include an interior and exterior red and green lighting system designed to enhance the communication between dock operating personnel and transport vehicle driver. A set of signs are frequently added to indicate when it is safe to enter the trailer or pull away from the dock area. The lighting sequence can be manually or automatically activated.



iDock® Controls

Installed with powered dock equipment from McGuire, iDock Controls provide an efficient interface with membrane dome button technology for ease of use and an interactive message display for valuable equipment usage, bypass control, sequence instructions, notifications and other information. iDock Controls also have a 3-color light communication combined into one large LED light assembly.



myQ® Dock Management Software

Loading dock equipment installed with iDock Controls from McGuire has the ability to connect to the cloud with myQ Dock Management. To do so, internet access is required for gateway devices at the docks, either by running ethernet and installing LAN ports, or by setting up a stable WiFi network at the docks. If ethernet is selected, consider installing ports at approximately every 7-10 dock positions. Once the docks are connected to the internet, an online dock management software can be used to quickly review the current status and availability of all your loading docks, what the most recent loading activity has been, and how all of the docks have been performing. The system will even send text/email alerts of events that occur at the docks.

Additionally, the historical data allows you to monitor changes in loading efficiency, compare each dock performance over time, analyze how your docks are utilized, and ultimately help improve load times and turn times.

Seals and Shelter Selection

Seals and shelters close off the gap between the trailer and the building, maintaining a controlled atmosphere at the dock while protecting the freight from the outside elements.

There are two types of sealing systems:

- Compression foam dock seals – Mounted to the wall at the loading door and seal against the back of the truck. The seals are made of foam covered with fabric.
- Truck shelters – Rigid or flexible frame equipped with curtains. The frame is installed onto the building wall. The curtains extend and seal against the wall and the side of the trailer.

Proper selection is imperative to sealing your building from outside elements. Improper selection can result in unsafe docks, damaged freight and decreased productivity. When choosing a sealing system, review the trucks frequenting the docks and what will effectively seal them. Other factors to consider are driveway slope, door sizes, dock height, dock bumper projection, and building wall construction.

Benefits

- **Energy Savings** - lowers heating and cooling costs, quickly paying for itself
- **Safety and Productivity** - reduces outside precipitation entering the loading dock area, which then correlates to workplace environment and its safety
- **Freight Protection** - minimizes entry of vermin and keeps harmful weather out
- **Security** - prevents product theft and unauthorized entry
- **Storage** - docked trailers are secure, climate controlled extensions of the building

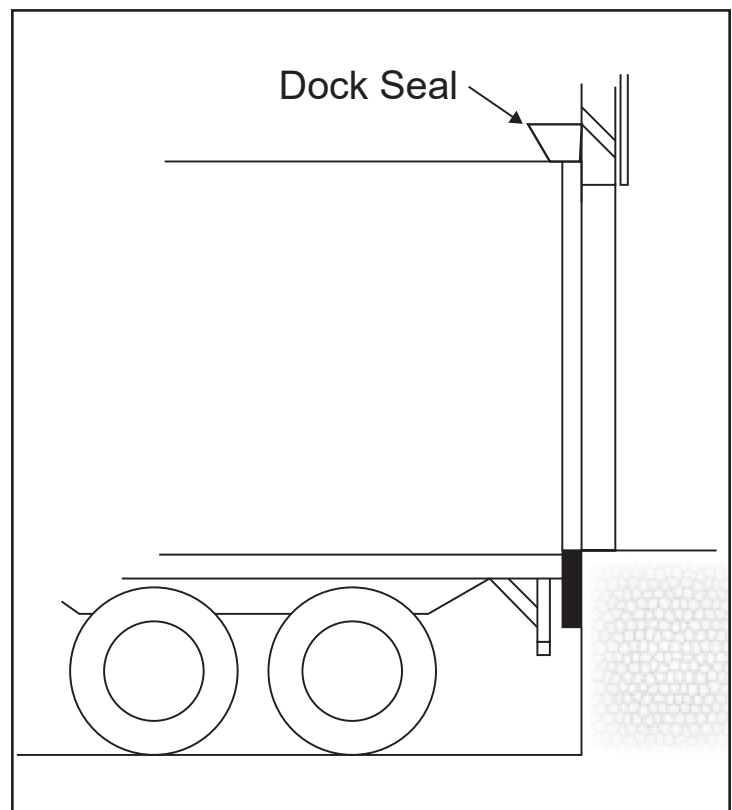
Guidelines to follow when specifying compression foam dock seals:

- The compression force on the building is approximately 80 lb per square foot of pad length
- To accommodate the compressed thickness of the seal a minimum of 4" from the building wall to the face of the dock is needed
- Typical pad projection is 6" past the bumper - with a minimum of 4" and maximum of 8"
- A recessed driveway with a slope of more than 1% requires a taper seal. For every 1% of slope the seal should be tapered 1" over its length

Compression Foam Dock Seals

Compression foam dock seals are more effective for sealing the space between the truck and the dock than a shelter system. However, seals have limitations such as accommodating a narrow range of trucks, limiting access to the truck's interior, and they do not work well with trucks that have rear loading platforms.

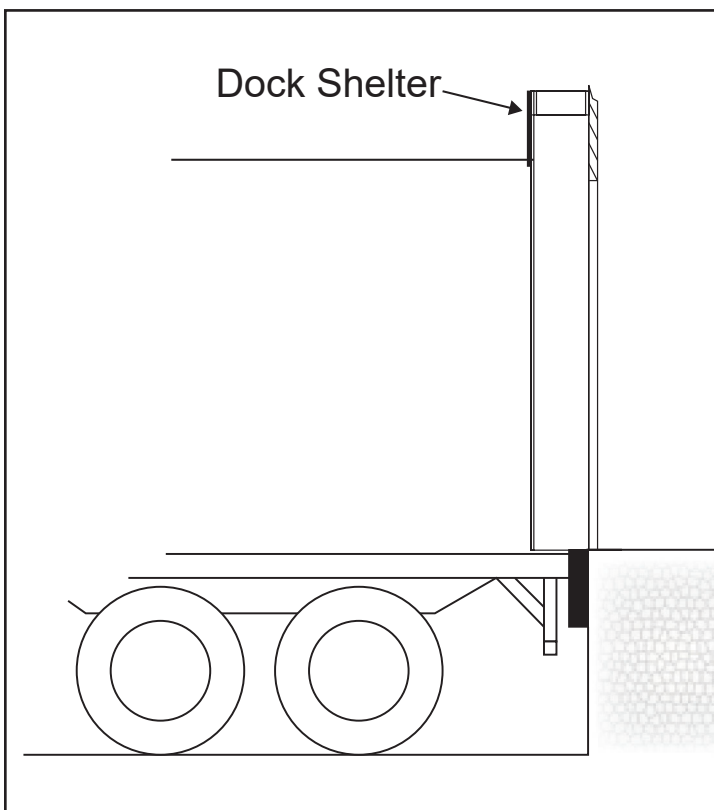
For optimal results, seals are best installed with an opening between 7'6" and 7'10". This will allow you to service most trucks. For doors wider than 7'8", make sure to specify beveled side pads.



Truck Shelters

Truck shelters provide full access to the interior of the trailer but do not seal the hinge of the trailer's swing out doors.

Shelters can be installed on nearly any door but are typically installed on doors larger than 9' wide and 10' high. Unlike seals, they will accommodate trucks with extended tailgates or rear platforms and will give full access to the trailer interior.



Guidelines to follow when specifying truck shelters:

- Minimum shelter width is 11'6" (O.D) measured across the side frames with standard opening width of the shelter 7' measured between the insides of the side curtains
- The bottom edge of the shelter should be set on top of the dock bumper
- The top of the shelter should be set at least 18" above the top of the highest truck to be serviced (typically 15' off grade)
- The shelter should project 14"-20" beyond the dock bumpers. For a shelter wider than 12'0", increase the extension by 6" over the minimum recommendation.

EQUIPMENT SELECTION - PHASE 3

Accessories

McGuire provides all of the extra items used at the loading dock, such as protective and safety systems, energy saving solutions, lighting and communication along with many other dock accessories.

These products can help you improve your loading dock's efficiency and productivity and protect your employees from dock-related accidents while enhancing your loading dock communication and safety. These products are designed to reduce damage and increase productivity at the loading dock.

Such items include wheel chocks, swing arm dock lights, specialty LED guide lights, snake style LED truck lights, custom weather seal options, wheel chock cradles, door track protection, barriers, specialty custom signs and many others.

