

PENTALIFT LOADING DOCK DESIGN GUIDE



OVERVIEW

Just-in-time logistics, steady product flow management, and the never-ending drive for maximum efficiency have intensified the attention given to loading dock design. A multitude of fluctuating variables must be considered when co-ordinating dock heights and door sizes, and when selecting the proper loading dock equipment.

This guide was created to assist in the design of the loading dock area and the selection of the loading dock equipment.

The major areas of consideration are:

1) Safety First	Pg. 2
2) Dock Area Design	Pg. 6
3) Dock Levelers	Pg. 16
4) Dock Bumpers	Pg. 30
5) Vehicle Restraint Systems	Pg. 31
6) Seals/Shelters	Pg. 35
7) Elevating Docks	Pg. 41
8) Combi-Docks	Pg. 43
9) Truck Levelers	Pg. 44



A display of Pentalift product brochures can be found on the back cover of this guide.

Throughout the planning process, future requirements should always be addressed. The need for more door openings and more storage capability should be incorporated into the layout of the new building prior to its construction to save a great deal of cost and frustration later.

Pentalift encourages the use of this planning guide to ensure effective dock design and equipment selection.

Note:

This guide is designed and provided to assist in the selection of the appropriate loading dock equipment for the application under consideration.

The guide is based on information that has been used and referenced to specify loading dock equipment for loading dock installations.

This Guide is intended to provide "Rule of Thumb" general information.

Due to the diversity and variations that may exist at a loading dock, any specification should be developed and approved by an experienced loading dock equipment specialist.

Pentalift Equipment Corporation disclaims any responsibility and liability for the use of the information contained in the Pentalift Loading Dock Design Guide.



SAFETY FIRST

Loading dock accidents can be avoided by taking proven precautions. Warehousing and Distribution are rated among the most hazardous of all industries. A single accident can total as much as one million dollars in insurance, downtime, and liability costs. These expenses can cause financial hardship affecting the entire operation.

To ensure employee safety and an efficient product transfer system, think of Safety First.

Several styles of loading dock safety systems are readily available. They are designed to accommodate various dock configurations to minimise the potential of:

- * unscheduled truck departure
- * trailer theft
- * collapsing landing gear
- * trailer creep
- * dock leveler freefall

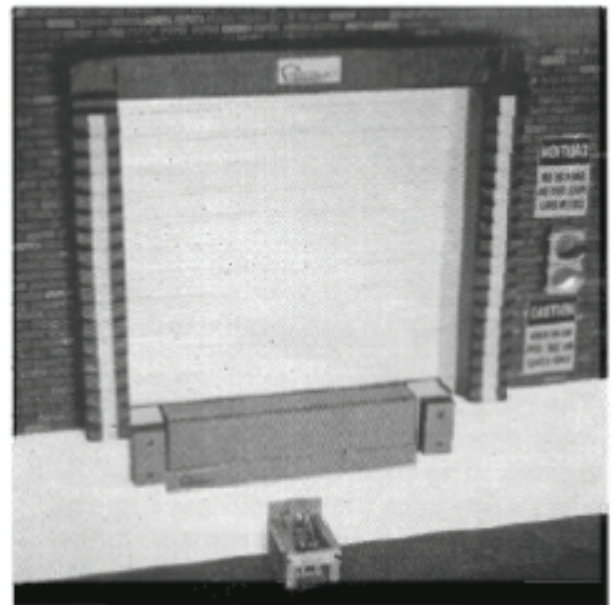
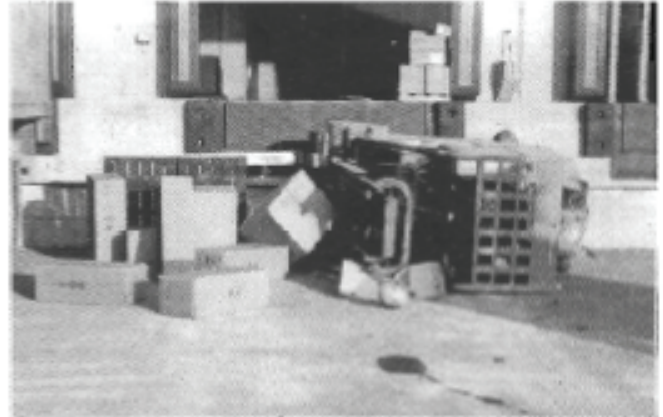
The fact that every loading dock is characterised by its own special requirements makes it impossible to apply a single style of safety system to every installation. A safety system that offers the greatest protection against an accident at each particular loading area must be selected.

Incorporating one or a combination of the following devices will reduce the potential of a loading dock accident.

VEHICLE RESTRAINTS

Vehicle restraints are designed to hold the trailer in place by locking onto the truck's/trailer's rear impact guard, commonly referred to as the R.I.G. (Rear Impact Guard) bumper. The R.I.G. bumper extends down from the rear of the truck / trailer. Restraining a vehicle in this way prevents premature vehicle departure which can cause serious injury. A two-way deluxe communication system is usually part of a vehicle restraint installation.

In January 1998, an updated Federal Motor Vehicle Safety Standard came into effect. It established standards for the strength and position of R.I.G. bumpers on new semi-trailers.



SAFETY FIRST

COMMUNICATION LIGHT SYSTEM

Signs and a two-way high visibility light system (Fig 1) indicate to the operator that a truck is in position and tells the truck driver that the loading/unloading process is still in progress. The high visibility deluxe light unit mounts to the exterior wall along with the warning signs. They are positioned so the truck driver can see them easily and clearly. The light system should be interlocked with the Dock door and a vehicle restraint for increased safety.



Fig 1 Communication system components

HYDRAULIC DOCK LEVELER WITH ROLL-OFF STOP LIP

The solid steel lip on the Roll-Off Stop Lip dock leveler (Fig 2) forms an 8" high steel barrier when its lip is in its parked position. The Roll-Off Stop Lip is designed to prevent material handling equipment from rolling off the dock.

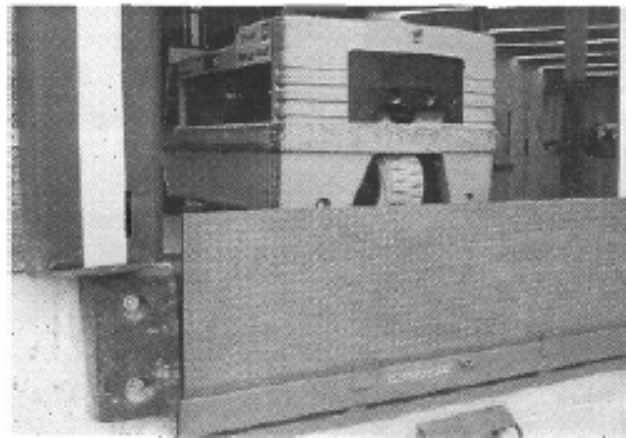


Fig 2 Roll-Off Stop Lip Dock Leveler

ULTRAHOOK RESTRAINT

The Ultrahook Restraint (Fig 3) is one of the most effective forms of a vehicle restraint safety system. The Ultrahook can locate and hold almost any truck trailer providing it has an R.I.G. bumper. A two-way communication system is incorporated with an Ultrahook Vehicle Restraint Safety System.

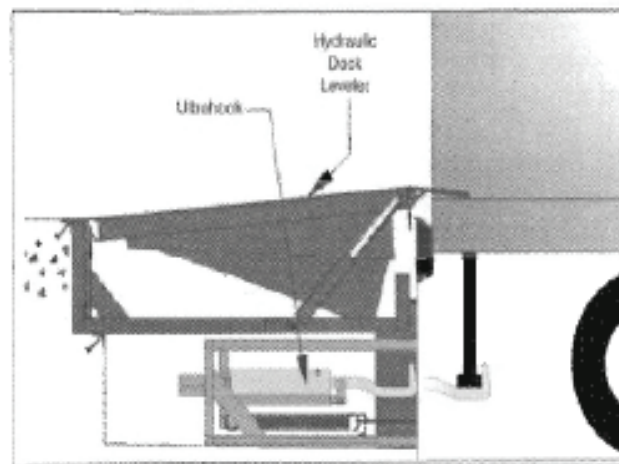


Fig 3 Ultrahook restraint installed below dock leveler

MANUAL WHEEL CHOCKS

The wheel chock (Fig 1) is the oldest form of safety device to guard against trailer creep. Wheel chocks are tapered blocks with a length of chain that are placed in front of the vehicle wheels once the vehicle is positioned. There are many disadvantages to using **manual** wheel chocks:

- 1) Loading dock personnel may find them inconvenient and will not use them.
- 2) Should the chocks be lost or stolen, the trailer cannot be secured.
- 3) The time necessary for manual positioning of chocks can add up to a significant expense in man-hours.

NOTE: TO GUARD AGAINST TRAILER CREEP, TRAILERS EQUIPPED WITH SPRING BRAKES ARE NOT EFFECTIVE OR SAFE.

In recent years, many trailers have been equipped with spring brakes. Spring brakes are designed to minimise trailer movement when the brakes are in use. However, a trailer equipped with spring brakes can still creep forward during the loading/unloading activity which could cause the lip of the dock leveler to lose its penetration into the trailer thus creating a hazard for the lift truck operator. An effective vehicle restraint system will minimise trailer creep and it will restrain both spring brake equipped vehicles and those which do not have these brake units installed.

NOTES FOR NON-NORTH AMERICAN DOCK DESIGN

In North America, it is law that all conventional semi-trailers must be equipped with R.I.G. bumpers. However, outside North America requirements are different. Sea container, freight and hydraulic tailgate trailers are very common. These styles of vehicles may not have R.I.G. bumpers. These vehicles will require special consideration.

SAFETY FIRST



Fig 1 Wheel Chock in position against tire

Consult a Pentalift Sales Representative to determine the best dock safety system for your facility.

OPERATOR TRAINING

Installing loading dock safety equipment is a first step toward minimising hazardous and costly accidents. The loading dock personnel must then be educated and trained on how to use the equipment and identify the warning signals. If a person does not fully understand a particular piece of equipment they are unlikely to use it. Safety equipment that is not utilized cannot protect anyone. It is the employer's responsibility to ensure proper training is provided for the loading dock workers. Unused safety equipment can give the operator a false sense of security and increase the potential for an accident.

For more information, please request the product brochures on Pentalift's Vehicle Restraint products.

SAFETY FIRST



Fig 1 Pentalock HFR32 Vehicle Restraint engaging the truck's R.I.G. bumper. (Note the exterior signs and light unit – part of the HFR32 vehicle restraint's communication system)

SAFETY EQUIPMENT IS ONLY EFFECTIVE IF IT IS UNDERSTOOD AND USED. IT IS IMPORTANT TO INTERLOCK THE EQUIPMENT IN AS MANY WAYS AS POSSIBLE TO ENSURE CONSISTENT AND EFFECTIVE PROCEDURAL PROCESS.

FOLLOW THE INSTRUCTIONS ON THE EQUIPMENT AND THOSE IN THE OWNER'S MANUAL.

DOCK AREA DESIGN

Dock area design requires the consideration of the following variables:

- 1) Truck / trailer bed height
 - * Air Ride Suspension
 - * Sea Containers
- 2) Dock approach
- 3) Apron space
- 4) Dock positioning
- 5) Dock height
- 6) Door size

TRUCK / TRAILER BED HEIGHT

Trucks / trailers are built with a range of differing truck bed heights. A good loading dock design will accommodate the different truck bed heights that may come to the dock.

A typical loading dock may at some point, service every type of vehicle on the road. It is essential to take into account the dimensions of the trailers that will be visiting the loading dock with the highest frequency. This determines the most appropriate elevation for the dock itself. Secondary consideration must be given to the dimensions of vehicles that visit the dock less frequently. In the case of a captive fleet (only one style of trailer) being serviced at the facility, then the choice of design is simple. However, due to the range of vehicles on the road, and the ever-increasing use of "Air Ride" trailers, it is vital to consider all of the possible variations that can occur. A valuable tool to assist with the planning of the loading dock is the Loading Dock Survey form (pages 25 & 26). One part of this form requests critical information about the types of vehicles that may be present at the loading dock. The information collected on the Loading Dock Survey form will prove valuable in developing the specifications for the loading dock equipment.

Air Ride Suspension Vehicles

Vehicles equipped with Air Ride suspension systems are becoming the most common suspension configuration. These types of suspension systems can cause problems at the loading dock.

Although the recommended practice for air ride equipment is to purge or "dump" the air from the suspension before the vehicle is positioned at

the dock, all too frequently, this is not done. As a result, the bed of the vehicle can lower 6" to 8" when a load comes onto the truck / trailer. This movement can tear up the dock seals / shelters and dock bumpers and with certain styles of dock levelers, the lip plate may lose its penetration and contact with the vehicle. In certain cases, the lip on a mechanical dock leveler could drop into a pendant position creating a barrier which could prevent the lift truck from exiting the vehicle. The 6" to 8" of downward movement by a short deck dock leveler can create a severe decline which may cause difficulties for the materials handling equipment being used to unload the truck / trailer.

Additionally, the range of movement of air ride equipped vehicles when at a dock can subject the operating components, more specifically the hold-down of a mechanically operated dock leveler to increased stresses which result in greater wear and tear and higher ongoing maintenance costs. Further, mechanical levelers equipped with mechanical safety legs can complicate loading / unloading operations since they can prematurely engage and stop the downward movement of the dock leveler deck until the legs are manually disengaged. This is referred to as "Stump-Out".

A Vehicle Restraint should be considered for loading docks servicing air ride trucks / trailers due to the fact when the air is "dumped" the truck / trailer can creep forward thereby reducing the lip penetration of the dock leveler.

Important design considerations for loading docks servicing Air Ride trucks / trailers:

- * **Specify a hydraulic dock leveler to minimise "wear and tear" on leveler components**
- * **Specify a longer deck length dock leveler to minimise the incline / decline**
- * **Specify steel-faced laminated dock bumpers for durability and long service**
- * **For dock seals or shelters, specify inflatable models**
- * **Avoid Edge of Dock type levelers or dock plates which cannot accommodate the "float" typical with air ride vehicles**
- * **Specify a Vehicle Restraint to prevent trailer creep and maintain lip penetration**



DOCK AREA DESIGN

Sea Containers

Facilities that must accommodate sea container freight need to be particularly flexible in terms of the truck bed heights that will need to be accommodated.

Sea containers and refrigerated containers can have trailer bed heights of up to 62". At the same time these facilities may service frequent deliveries/pickups by tailgate trucks and low bed trucks. The height difference can be as extreme as 30" at the low end and 62" at the high end. Consideration must be given to multi-height dock designs or to the installation of equipment such as a hydraulic Truck Leveler (Page 44) or an Elevating Dock (Page 41, 42). These pieces of equipment will facilitate the extreme truck/container height differences.

DOCK APPROACH

The dock approach is the topographical configuration of the area used when backing vehicles into position. This area can be a level approach, declined approach (slightly angled toward the building), or an inclined approach (slightly angled away from the building).

An ideal design is a slightly inclined approach that does not inhibit the positioning of trailers, but allows water runoff away from the building (Fig 1). This also helps prevent the potential of damage to the building from trailers that are severely angled when positioned by jockey trucks.

In most cases, severely inclined or declined approaches are undesirable.

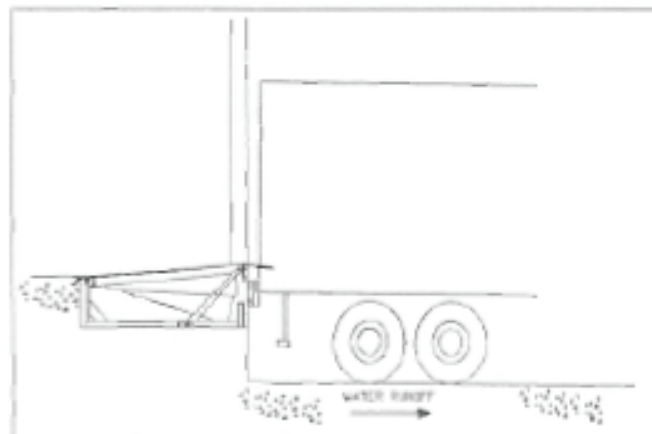


Fig 1 Inclined dock approach

Declined approach areas are constructed when the floor of the building is even with the exterior grade level. To achieve a proper dock height for truck loading / unloading operations, the approach to the dock needs to be built incorporating a decline to the building.

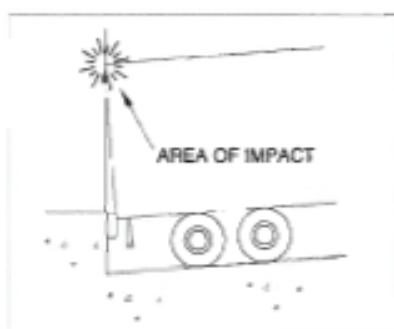


Fig 1 Declined dock approach

There are some issues of concern with a declined approach to the dock. These include: difficult snow removal, water drainage, build-up of debris and high impact forces to the dock. There is also the potential for serious damage to the building wall from impact by the top of the trailer (Fig 1).

Due to the slope of the approach into the dock, trucks backing into the dock can generate severe impact forces from only a short distance. Increased bumper projection or a projected dock must be provided to avoid building damage (Fig 2).

Special consideration must be made when incorporating other dock equipment when there is a declined approach to the dock. Dock seals need to be tapered to match the angle of the trailer. If the seals are not tapered, effective sealing will not be accomplished and damage to the dock seals is likely. Vehicle restraints must also be installed with sufficient projection to ensure their proper operation and effectiveness.

For vehicle restraints that mount to the face of the loading dock, consideration must also be given to the truck bumper (R.I.G. Bumper) height in relation to the fully lowered height of the vehicle restraint. It is important to confirm that the R.I.G. Bumper will not impact the vehicle restraint as the truck backs into the loading dock. Dependent on the elevations of a specific application, declined approaches can increase the probability of concerns in this area.

DOCK AREA DESIGN

Before planning a declined approach, consider the above factors and consult a Pentalift Sales Representative.

Avoiding the potential for impact against the building wall is easily accomplished.

For new construction projects, the dock can be projected sufficiently to prevent the top of the trailer from impacting against the building wall.



Fig 2 Overcoming dock approach impact

When reconstructing an existing building, it may not be possible to project the dock. In such situations, it is best to project the bumpers by the use of build-out blocks. The build-out blocks should be manufactured and supplied by the manufacturer of the dock levelers.

DETERMINING GRADE

The required projection is determined based on the percentage of grade. To calculate the grade, measure the difference in height from the dock to fixed point approximately 50' directly out from the dock. Divide the height difference by the length measured, using inches (e.g. 18" difference over 600" distance. $18/600 = .03 \times 100 = 3\%$ grade).

BUMPER PROJECTION

Use the following chart to select the proper dock or bumper projection.

Change in height in the 50 foot distance from dock face *	6" 12" 18" 24" 30" 36" 42" 48"
Dock or bumper must project (minimum)	5" 6" 7" 8" 9" 10" 11" 12"

* For intermediate dimensions, use this chart but round up to the higher value.

APRON SPACE

The configuration of the area required to manoeuvre and position trailers into place is called the apron space. Planning apron space requires recognising trailer movement and the amount of room it takes to achieve that movement. Traffic flow and vehicle length are key factors for consideration (i.e. a truck with an overall length of 70' requires a minimum apron space of 150').

If the apron area is to be surfaced with asphalt, a concrete landing strip (Fig 1) must be poured. In warm temperatures, the landing strip will prevent the trailer's landing gear from sinking into the asphalt when spotted.

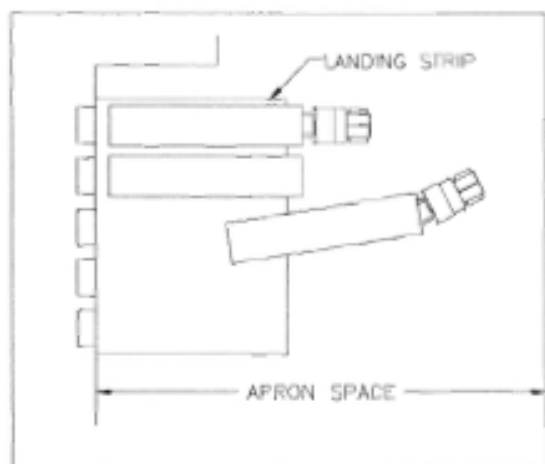


Fig 1 Landing strip and apron space

At the minimum, size the landing strip for the longest trailer that will visit the dock less 7 feet. A gravel-covered apron space should be avoided because it creates uneven and unsafe conditions.

A simple guideline for determining apron space is to take the sum of the longest possible combination of truck and trailer lengths and multiply this dimension by two. It is also recommended to add a safety factor of 5' to 10' depending on the available room (See Fig 2).

DOCK AREA DESIGN

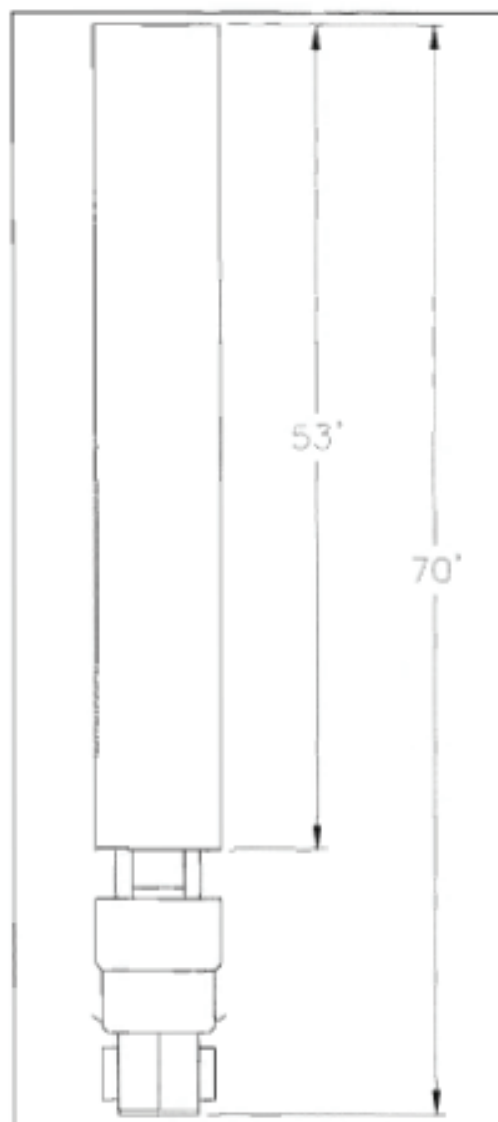


Fig 2 Calculating apron space
e.g. $(70' \times 2) = 140' + 10' = 150'$

Remember to always use the longest combination of truck and trailer length dimension.

Keep in mind that trailer jockey trucks should not be used to determine apron space, unless used exclusively, because they require substantially less room to manoeuvre than standard over the road trucks.

DOCK POSITIONING

Dock positioning involves the physical layout of the dock doors and levelers. The most common dock arrangement is a flush wall with doors spaced on at least 12' centres (Fig 1). If special trailers frequent the facility, door spacing may need to be increased. Twelve-foot centres allow for an overall truck width of 10' including side mirrors. Narrower spacing is possible when room is limited. When incorporating narrower centres, give consideration to common member dock seals and shelters. (See Seals / Shelters section Page 35).

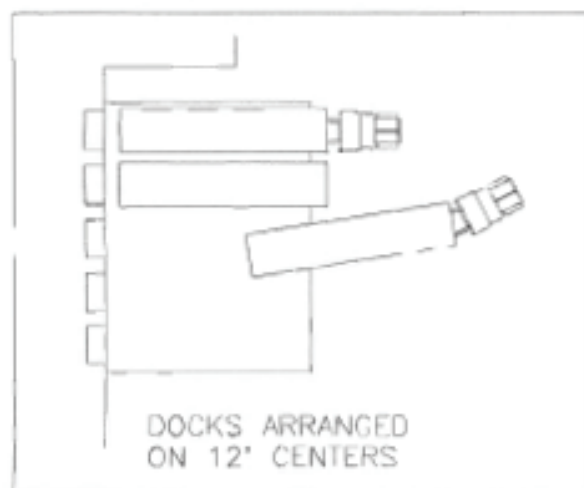


Fig 1 Docks arranged on 12' centres

Enclosed docks (Fig 3) are generally used when climate control, product protection, security, and / or overhead lift capabilities are required. They are not a common choice due to high construction costs and vehicle exhaust pollution considerations.

DOCK AREA DESIGN

Where space is limited for vehicle positioning, a sawtooth dock arrangement may offer a solution (Fig 2). The building wall is generally set back leaving the dock open and unsheltered from the outside environment. For that reason, a canopy should be utilised to offer worker and product protection. One disadvantage of sawtooth docks is the amount of internal floor space taken up.

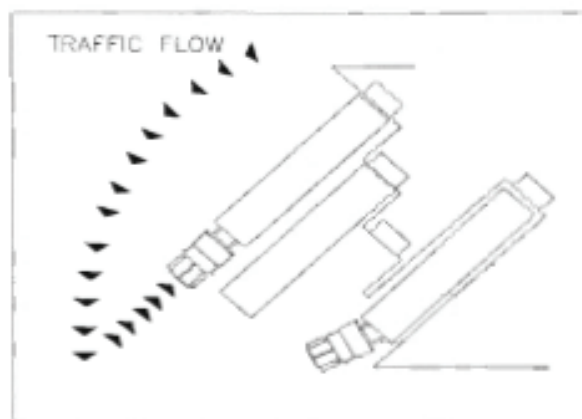


Fig 2 Sawtooth dock arrangement



Fig 3 Enclosed dock

DOCK HEIGHT

The dock leveler is intended to accommodate the differences between the loading dock height and the truck / trailer bed height.

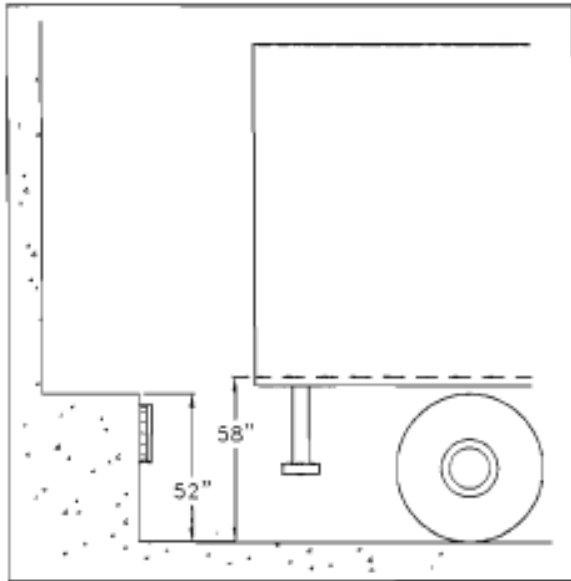


Fig 1 Dock and vehicle bed height differential

Longer dock levelers will accommodate greater height differences. The longer deck reduces the angle of incline / decline that results when the dock leveler is positioned.

The height differential between the loading dock and the trailer bed and the potential for "float" of the truck / trailer bed during loading / unloading are considerations of great importance in dock area design. Optimal dock height plays an important role in guaranteeing smooth product transfer from vehicle to building and vice versa. As mentioned earlier in this guide, vehicle beds may range from 30" to 62" in height. The question is: "What vehicles will be serviced at the facility with the greatest frequency and how much will these vehicles "float" during loading / unloading operations?" With these questions answered, all or a majority of the docks should be made to accommodate this bed height. The questions asked in the Loading Dock Survey form (pages 25 & 26) can assist you in your planning.

DOCK AREA DESIGN

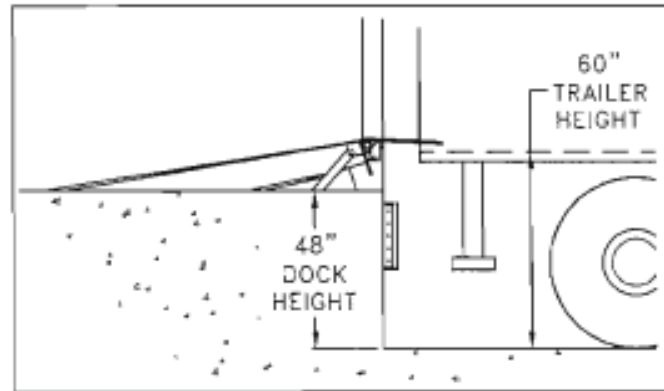


Fig 2 Substantial height differences between dock and trailer can create severe dock leveler grades, decreasing the overall effectiveness of the operation

A dock area should be flexible enough to accommodate any vehicle. The most common dock height is in the range 48" - 52".

Improper applications and use of dock levelers where there is a severe grade difference can result in product damage and cause significant safety concerns. The stresses created by significant inclines / declines for the dock equipment can contribute to the premature failure of both the dock levelers and the material handling equipment in use (lift trucks).

Customised dock levelers can be made to suit unique applications and offset the height difference.

Many manufacturers do not offer levelers over 12' long. Pentalift can provide dock levelers up to 20' long, or customise them to meet your needs.

Additionally, an elevating dock installation may be a viable solution in a particular situation (see page 41).

Please contact a Pentalift Sales Representative for further information.

DOCK AREA DESIGN

Tailgate trucks are the most difficult to accommodate at a standard loading dock. Before loading/unloading can be done, the tailgate must be lowered. Once lowered, it may be impossible to back the trailer close enough to the dock before impacting the dock wall (Fig 1). Note: Some powered tailgates retract below the truck. These trucks can be positioned and serviced at normal dock areas.

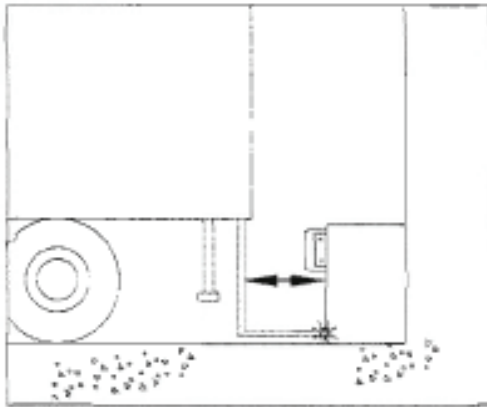


Fig 1 Tailgate truck at a loading dock

The solution to this situation is to use a self-supporting pit design. The dock leveler pit is poured 3-sided, open to grade level. A step is made at the rear of the pit to support the back frame assembly of the leveler. Steel support brackets called chairs are poured into the concrete or welded to the front curb angle to support the front channel of the leveler (Fig 2).

Pentalift manufactures a range of dock levelers for this style of installation. Be sure that the manufacturer chosen to supply levelers is familiar with and has experience with this type of installation.

A dock area should be flexible enough to accommodate any vehicle. The most common dock height is in the range 48" - 52".

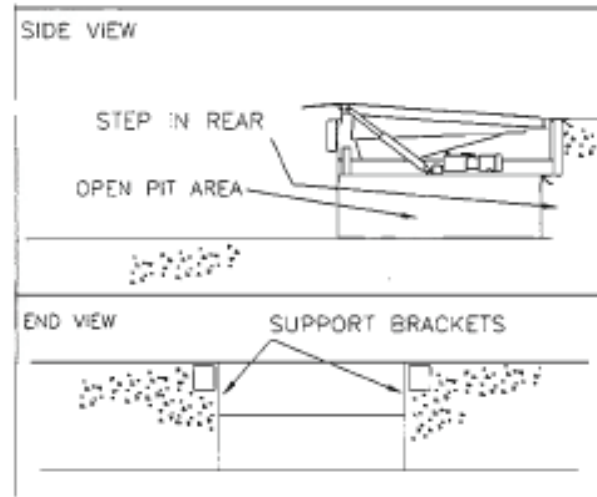


Fig 2 Self-supporting pit design provides an open pit with access for powered tailgate (see Fig 3)

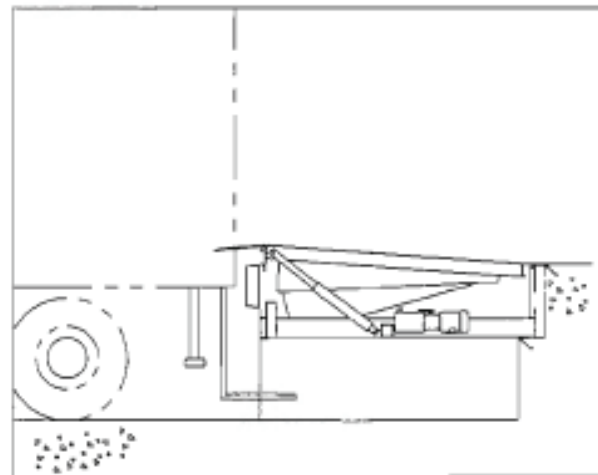


Fig 3 With the self-supporting pit design, the tailgate passes under the leveler to allow dock leveler use for loading/unloading

The open pit design also facilitates the easy removal of debris build-up from under the leveler, thereby improving both building aesthetics and the sanitary conditions.

Self-supporting is a common mounting style of dock leveler in Europe.

DOOR SIZES

Selecting the proper door size is essential when planning the loading dock. Improperly sized doors can create logistical headaches, reduce department efficiency, and result in product damage. 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.

Door Width

Most older trucks / trailers on the road are at least 96" (8') wide, and an increasing number are 102" (8'6") wide. A 96" (8') door width can service these trucks, but manoeuvring room is limited. Another concern with 96" (8') door widths is off-centre truck positioning. This can lead to further reductions in efficiency and even result in the requirement to reposition the vehicle.

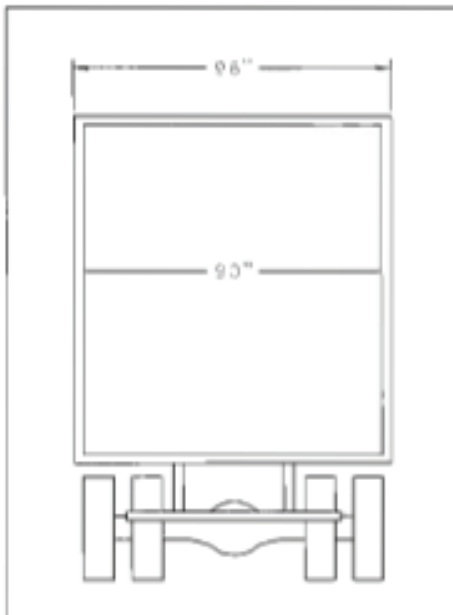


Fig 1 Standard trailer sizes for over the road vans are 96" (8') to 102" (8'6") wide

DOCK AREA DESIGN

Ideally, 108" (9') wide doors should be used to service 102" (8'6") wide trailers (Fig 2). Side-by-side palletising is simplified and the potential for product and door damage is significantly reduced. A 108" (9') door width can also accommodate the unplanned servicing of many oversized loads.

For special applications with oversized loads, a 120" (10') wide door can be incorporated.

Wider doors require more building space which can create a problem when room is restricted.

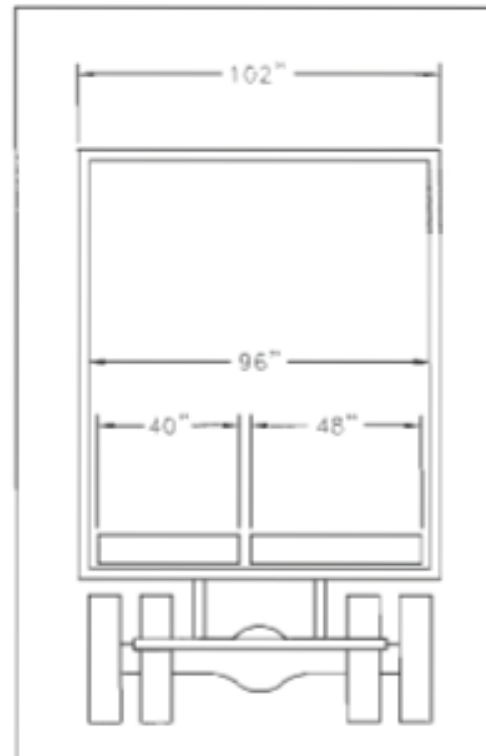


Fig 2 Maximised pallet loading with 102" (8'6") wide trailers

Door Spacing

Doors should be spaced with 12' centres. This distance will accommodate the majority of vehicles, allow for the installation of dock seals/shelters, and the mounting of two-way communication light systems.

DOOR HEIGHTS

Trailers can range in height from flatbed units (approximately 48") to closed vans (162" from ground level). The highest internal height for product loading is approximately 114" high.

Depending on the application, there are three basic door heights that are typically specified. Keep in mind that the common dock height is 48" - 52".

Doors (96") (8') in height can accommodate many loading/unloading operations, but they do not facilitate full floor to ceiling loading of the trailer with product (Fig 1). The need to optimise the available height (floor to ceiling) in a trailer in an effort to minimise freight costs, this need makes the 96" (8') high door a less desirable choice.

A 108" (9') high door permits improved floor to ceiling loading of product (Fig 2) because a higher load can easily pass under the door opening. Fuller and tighter loading is possible with a reduced risk of product damage due to product impact with the door header. The 108" (9') height is a popular door height because it suits a wide range of applications. However, trailers with lower heights may create a gap at the top of a 108" (9') door. This gap can be sealed with an appropriately sized dock seal or shelter (See Seals/Shelters Page 35).

A third typical door height is 120" (10') (See Page 15).

Wider or higher doors do provide for even greater loading / unloading flexibility. However, they also enlarge the open area between inside and outside thereby increasing the potential air exchange and heat / cold loss.

DOCK AREA DESIGN

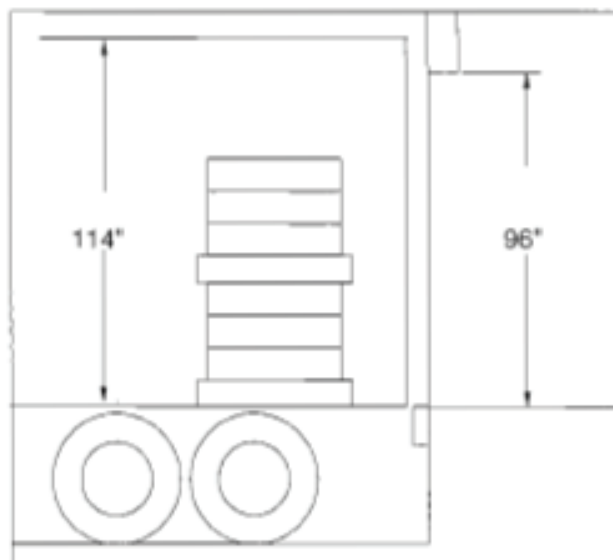


Fig 1 Doors that are 96" (8') high can accommodate many loading operations where height is not critical to product arrangement

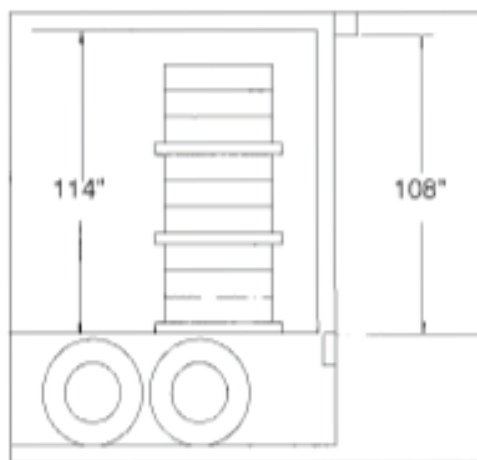


Fig 2 Improved space utilisation and reduced product damage result with 108" (9') high doors

DOCK AREA DESIGN

The most versatile door size is the 120" (10') high door. This height will service the full range of loading / unloading operations (Fig 2). A 120" (10') high door will accommodate trailers of all heights, up to and including high cube trailers and sea containers.

Special consideration should be given when choosing a dock seal or shelter for a 120" (10') high door. A properly sized dock shelter (Fig 1) or an inflatable dock seal (Fig 3) for a 120" (10') high door provides the greatest degree of unobstructed access to the rear of the truck / trailer.

Door sizes can be specified to any configuration required. Keep in mind the product characteristics and the possibility of future change.

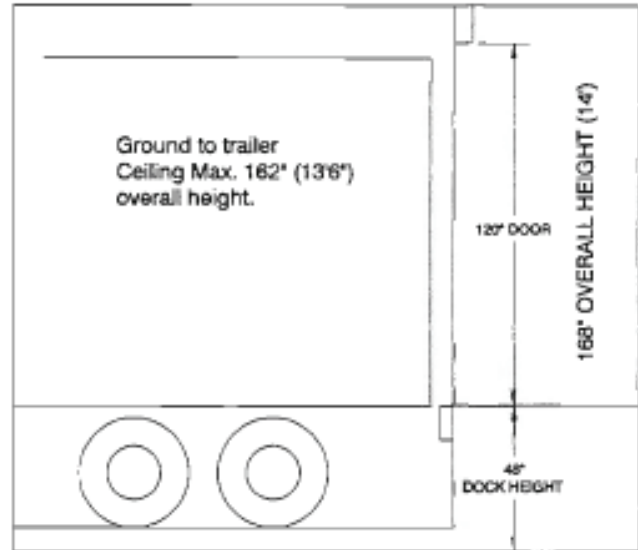


Fig 2 A 120" (10') high door is versatile and suitable for all loading / unloading operations

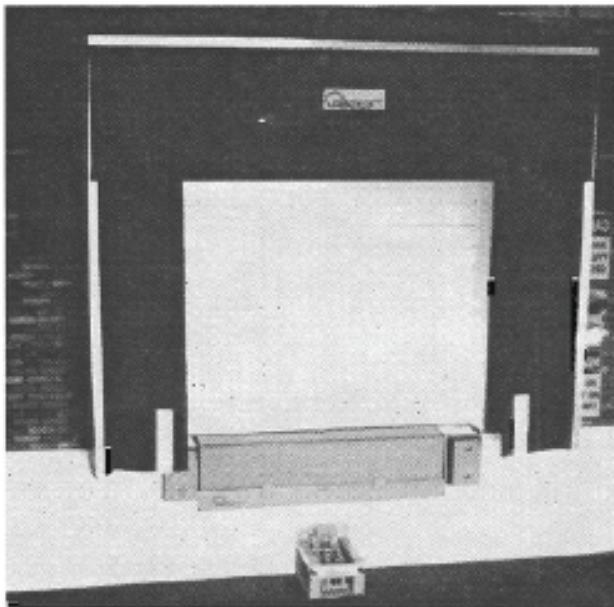


Fig 1 Use of a dock shelter achieves climate control and unobstructed access



Fig 3 Inflatable Dock Seal installation - Once the truck is in position, the side bags and the header bag inflate to seal the trailer / truck

One of the first considerations when selecting a dock leveler is to decide on the operation style. Two main styles of operation are available: hydraulic and mechanical.

MECHANICAL DOCK LEVELERS

Mechanical dock levelers model for model are initially less costly than hydraulic units. Mechanical levelers are operated through a combination of springs, cams and levers. Routine maintenance and lubrication are essential to maintain peak performance. A benefit of mechanical levelers is the elimination of electrical provisions and hook-ups. Mechanical dock levelers require more routine maintenance than hydraulic dock levelers.

To operate a mechanical dock leveler, the operator pulls on the ring of the release chain. This action disengages the hold down device and permits the lifting mechanism to raise the leveler deck and then extend and lock the lip in position. The attendant then "walks down" the deck until the extended lip of the leveler rests on the vehicle bed.

When the loading / unloading operation is completed, the operator pulls the ring on the release chain to again release the hold down to partially raise the deck (only if the unit was servicing below dock level). The lip will return to the pendant (retracted) position and the operator will then walk the deck down into the leveler's stored position.

An important feature of both the hydraulic and mechanical units must be the leveler's ability to "float" with the vehicle bed as the truck's / trailer's suspension allows the vehicle bed to move up and down during loading and unloading.

The ever-increasing use of trucks/trailers with "Air Ride" suspension systems is an issue of significance when planning a dock leveler installation. Air Ride equipped vehicles can move a considerable distance up or down when loading /unloading. The "float" associated with Air Ride suspension systems needs to be considered when selecting the style of operation of the dock leveler. The significant "float" associated with air ride vehicles results in severe "wear and tear" on the components – especially

DOCK LEVELERS

the hold down device - of a mechanically operated leveler. The "wear and tear" on the components do to significant "float" are not a concern with a hydraulically operated dock leveler.

It is also recommended in most cases that fixed rear hinges be specified to avoid both a potential impact hazard for loads and equipment. This hazard is caused by the back of the leveler rising up from the pit to a level above the cross traffic position. This condition also creates a trip hazard for pedestrian traffic at the loading dock.

All Pentalift dock levelers float with the vehicle bed and have a fixed rear hinge.

SAFETY FEATURES:

Mechanical Fallsafe

Mechanical safety legs will prevent the deck from falling to its lowest point of travel (only if the leveler is operating above level – see note below on "Stump-Out"). The legs must be manually released to allow below-level servicing. Although safety legs are a means of improving safety for a fallsafe condition, this issue can be better addressed through the use of hydraulic dock levelers with hydraulic fallsafe and the installation of a vehicle restraint system.

Note: "Stump-Out" is a concern for levelers equipped with mechanical safety legs. Dock leveler "Stump-Out" occurs when a loaded lift truck enters a vehicle causing the trailer bed to lower to the point where the mechanical safety legs contact their supports. The safety legs then stop any further downward movement of the leveler's deck. As a result, the lip of the leveler can present a steep angle of incline when the lift truck attempts to leave the trailer. "Stump-Out" is not a concern with hydraulic dock levelers.

Full Range Toe Guards

Full range toe guards completely close off the sides of dock levelers when the deck is in the fully raised position. Full range toe guards eliminate the potential pinch points that are created at the sides of the deck as it is lowered for use.

DOCK LEVELERS

HYDRAULIC DOCK LEVELERS

Hydraulic dock levelers require less routine maintenance and parts replacement than mechanical units, and they offer other benefits. High capacities, heavy loads, high usage and severe condition applications are best suited to hydraulic dock levelers.

Hydraulic Dock levelers "float" through the up and down action of the truck / trailer bed during loading / unloading operations with no stresses on any component of the leveler. For this reason, hydraulic dock levelers are the preferred operation style at loading docks which service Air Ride type vehicles due to the "wear & tear" and hold down maintenance requirements that result with mechanically operated dock levelers.

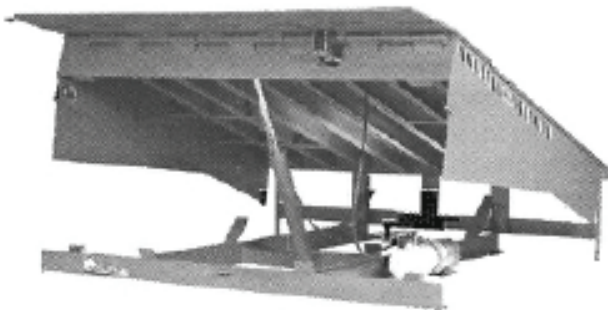


Fig 1 Pentalift HD Series Hydraulic Dock Leveler - Available in capacities from 25,000 to 160,000 lb

Increased safety, user preference and reduced maintenance are also important benefits that result from the specification of hydraulic dock levelers. A broader range of important options can be specified with hydraulic dock levelers. Some options include: deck stop, independent lip control, automatic return to dock, and the ability to interlock the dock leveler to other pieces of dock equipment – overhead door, inflatable dock seal / shelter vehicle restraint and or safety barrier.

Hydraulic dock levelers are simple to operate and require no bending or pulling on the part of the operator. Activation is simply achieved through the use of constant pressure push button control.

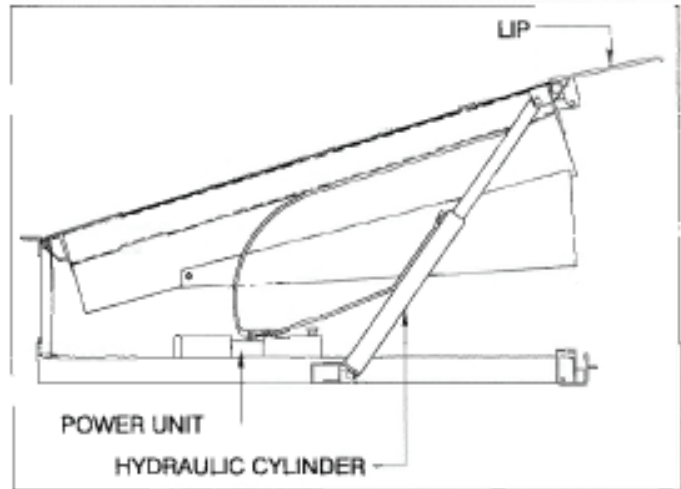


Fig 2 Hydraulic dock leveler

Safety concerns, especially a "fallsafe" condition, are more thoroughly addressed by using hydraulic dock levelers.

A "fallsafe" condition occurs when a dock leveler is in position on the bed of a vehicle and the vehicle prematurely departs while a lift truck is still on the dock leveler deck. Without fallsafe protection, the leveler deck will drop down to its lowest position, which could cause the lift truck to roll off the dock.

With a hydraulic dock leveler, installing a hydraulic velocity fuse provides protection in a fallsafe condition. The velocity fuse locks the leveler and stops its downward movement within a few inches when a fallsafe condition occurs.

SAFETY FEATURES: HYDRAULIC DOCK LEVELERS

Auto Return To Stored Position

Auto Return is a safety feature that automatically returns the leveler to its stored position (level with the floor) when a truck pulls away. Why is this important? Hydraulic dock levelers are downward biased. A hydraulic dock leveler operates due to the activation of the hydraulic system. The weight of the leveler and gravity move it downward. A hydraulic dock leveler in its raised position will lower unless it is supported by hydraulic pressure, the truck bed or some other mechanical device (maintenance stand). For a leveler without Auto Return, when loading/unloading operations are complete and the truck pulls away, the deck and lip of a positioned leveler lower and come to rest on the leveler's bottom support stops. This creates a recess in the dock floor. With Auto Return, the leveler automatically returns to the "parked" position.

Deck Stop / Independent Lip Control

The Deck Stop safety feature allows the operator to stop the deck immediately in any position by applying constant pressure to the red button on the control panel. The Deck Stop is also used to facilitate Independent Lip Control. Independent Lip Control allows the extension of the lip irrespective of the position of the dock leveler deck provided the lip is not restrained by the lip keepers. This option saves time by facilitating the positioning of the leveler in end loading situations when the loaded pallets are so far to the back of the truck / trailer that the lip of the dock leveler cannot be fully extended and then positioned on to the back of the vehicle.

Hydraulic Fallsafe

Fallsafe protection is provided by a velocity fuse which is installed on the base of the hydraulic cylinder. When a loading vehicle is on the deck of the leveler and if the truck pulls away, the velocity fuse will lock the cylinder and hold the deck in place with only a few inches of drop. If the leveler is being used at or above the cross traffic position, this feature assures that the leveler deck will not move to a declining sloped position in the direction of the driveway. This reduces the probability of the fork lift rolling off the dock and out the door.

DOCK LEVELERS

NOTE: The lifting cylinder should always be positioned to support the load without creating other hazards. See Pentalift product brochure D001 pg 4.

Roll-Off Stop Lip

When it is in its parked position, the solid steel lip on the Roll-Off Stop Lip dock leveler forms an 8" high steel barrier (Fig 1) to prevent material handling equipment from rolling off the dock. This design also offers protection from roll off during end loading and below level loading operations.

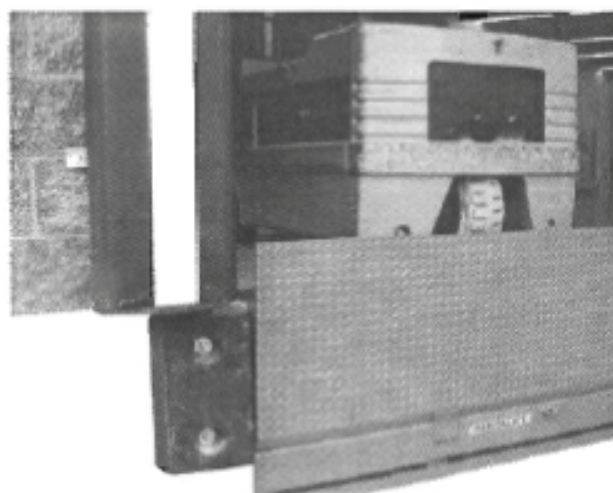


Fig 1 Roll-Off Stop Lip dock leveler in its parked position. Note the 8" high barrier created by the Roll-Off Stop Lip

Additionally, the Roll-Off Stop Lip serves to offer some protection from impact damage for the roll-up doors on trucks / trailers in position at open doors

Interlock Features

Hydraulic dock levelers can be interlocked to other pieces of the loading dock equipment, such as vehicle restraints and overhead doors. When interlocked to a vehicle restraint, the dock leveler cannot operate unless the trailer is properly restrained creating a safety system at the loading dock. An override switch is incorporated to allow independent equipment operation when the vehicle cannot be restrained. Interlocking the loading dock equipment increases safety.

DOCK LEVELERS

INSTALLATION STYLES

There are two installation styles for both hydraulic and mechanical dock levelers:

- 1) Preformed pit
- 2) Pour-in-place

Both styles have particular advantages depending on the application.

Preformed Pit

Many dock levelers are installed into pits that are formed into the concrete dock ahead of time. Preformed pits are sized to suit the specific dimensions of the dock levelers selected for the building.

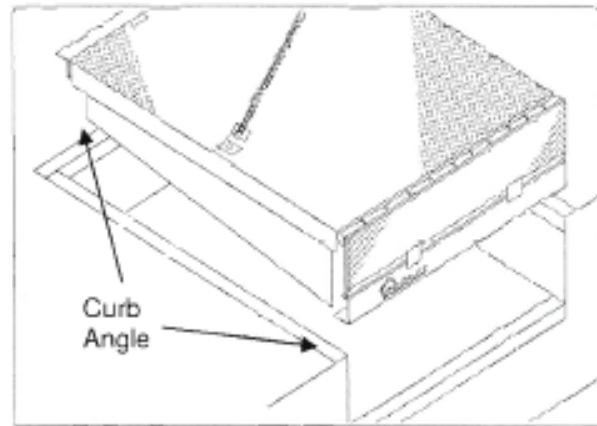


Fig 1 Sufficient curb angle must be provided for proper installation.

NOTE:

In general terms, pit style dock levelers have a lower initial equipment cost than similar pour-in-place units. However, a pit style dock leveler requires more time and cost to install the dock leveler. For this reason, when all the installation costs for the pit style leveler are taken into account, a pit style leveler installation may prove to be more costly overall than the purchase and installation of a pour-in-place unit.

DOCK LEVELERS

Pour in Place

With Slab

Many customers prefer pour in place installations for the reduced installation time and cost. A notch is made in the foundation wall for the leveler to be positioned into prior to the floor being poured (Fig 1). The dimensions for the notch are provided by the manufacturer of the dock leveler.

A concrete slab should be made for the leveler to set on during installation. The slab will offer greater support. After locating and leveling the dock leveler on the slab, the leveler can be lagged to the slab to prevent the leveler from shifting (Fig 2). Concrete can then be poured around the pan to the finished floor level.

Without Slab

When the dock levelers arrive, they are set into place, resting on the foundation cut-out and blocked up and fixed at the rear to be level with the finished floor. Concrete can then be poured around the pan of the leveler. Two pours are common, one to form a base under and around the bottom of the pan, and the second to secure the unit and finish the floor area. It is important that the concrete flows entirely underneath the leveler pan for proper support.

In all cases, consult the manufacturer for complete installation instructions and pit / cut-out dimensions.

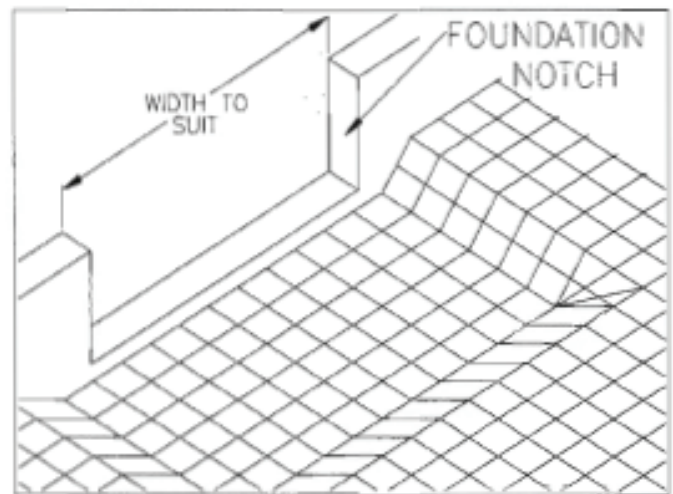


Fig 1 Foundation notch for pour in place dock

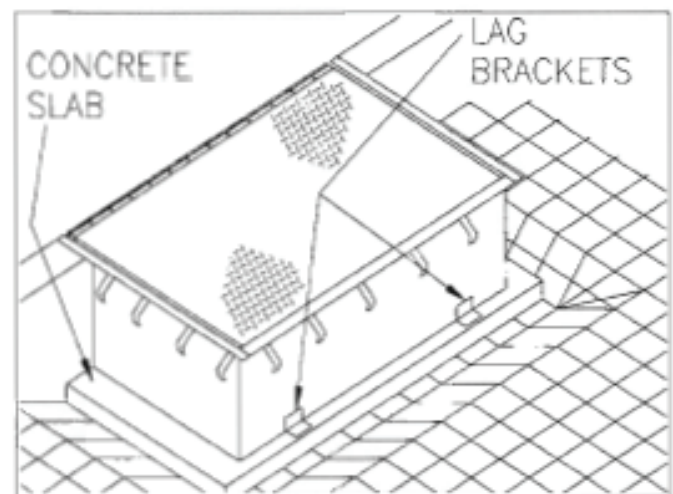


Fig 2 Concrete slab in place for the pour in place dock leveler

WIDTHS AND LENGTHS

Width Selection

Most manufacturers offer three standard widths in mechanical and hydraulic dock levelers: 6' wide, 6.5' wide and 7' wide, nominal. The 6' wide units are the most common and can accommodate the majority of applications (Fig 1).

With the advent of wider trailers and side-by-side pallet arrangements, there is a trend toward 6.5' and 7' wide levelers. The 7' wide leveler provides the best access for end loading side-by-side pallets (Fig 2). Some manufacturers recommend that the leveler lip be tapered at the end from 7' down to 6.5' wide to accommodate narrow trailers. With standard trailer bed widths at 96" (8'), tapering the lip is not necessary. Maintaining the full lip width allows maximum manoeuvring and eliminates the drop-off area created by tapering the lip. Not tapering the lip also facilitates the use of the entire dock width.

Pentalift manufactures standard and customised dock leveler widths to suit any application.

DOCK LEVELERS

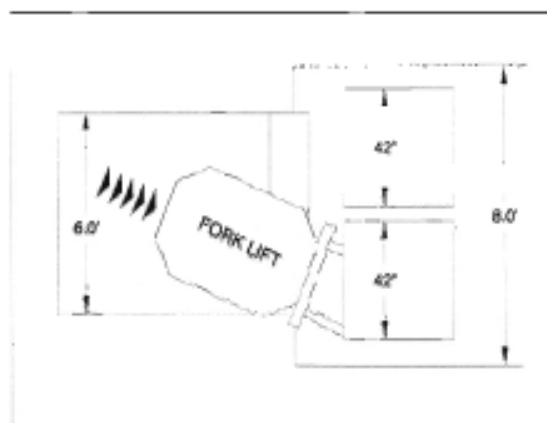


Fig 1 Six-foot wide dock leveler

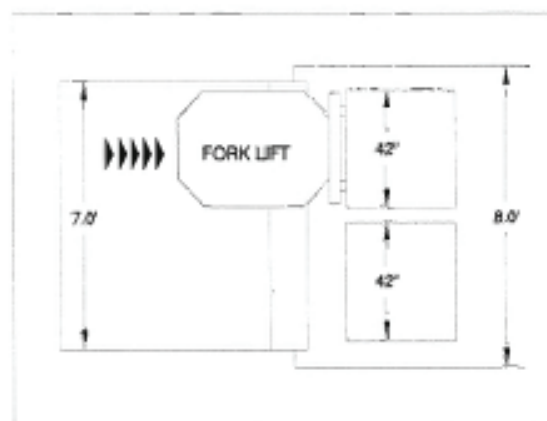


Fig 2 Seven-foot wide dock leveler

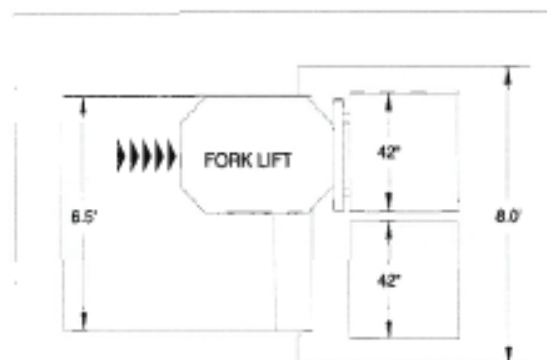


Fig 3 Six and a half foot wide dock leveler

DOCK LEVELERS

Length Selection

Proper selection of the leveler length will ensure many benefits such as:

- 1) Increased safety
- 2) Maximised dock leveler life
- 3) Maximised brake, transmission and tire life for loading vehicles
- 4) Reduced potential for goods spillage and damage
- 5) Maintained efficiency levels

Improper selection of a length that is too short will negatively effect the above items. When all selection criteria are met, and based on all other things being equal, it is true to say: *the longer the leveler, the longer the life due to less slope and impact.*

Recessed dock levelers are available in standard lengths from 6' to 10' long.

Pentalift manufactures special length dock levelers for custom/specific applications.

The most popular dock leveler length is 8' which accommodates the majority of applications. However, the length of the dock leveler should be in direct relation to the maximum height difference between the loading dock and the vehicle bed. Less height difference means a smoother transition between the building and the loading vehicle.

Note: Refer to the *Dock Area Design* section of this guide when determining the dock height.

Loading vehicles are designed for general use at certain grades. The following chart depicts the grades in relation to height difference and dock leveler length.

OVERALL DECK LENGTH			
HEIGHT DIFFERENTIAL	6' LONG	8' LONG	10' LONG
2"	3.4%	2.4%	1.9%
4"	6.8%	4.9%	3.8%
6"	10.2%	7.3%	5.6%
8"	13.7%	9.7%	7.5%
10"	17.1%	12.1%	9.4%
12"	20.5%	14.6%	11.3%

Normal **Maximum** Grade Operation

Manual Pallet Truck - 7%

Electric Lift truck - 10%

Internal Combustion Lift truck - 15%

Consult Manufacturer's Specifications for Maximum Grade Recommendations.

Keep in mind that these are normal maximum recommendations and can vary depending on equipment specifications, or changes through design modifications.

Another consideration when specifying leveler lengths is *under clearance*. The greater the height difference, the greater the chance for the *hangup* of loading vehicles with low under clearance such as manual pallet trucks. Plan the dock leveler length to achieve a smooth transition and to accommodate the range of loading vehicles that may be used.

DOCK LEVELERS

DETERMINING CAPACITY

Selecting the proper capacity for the leveler can be confusing due to the variables that must be addressed. Dock leveler manufacturers have different terminology to describe capacity such as rated load, dynamic capacity, rollover capacity, etc, which can add to the confusion.

To ensure proper capacity selection, consider these factors:

1. What is the configuration and gross weight of the loading vehicle? Specify the number, size and arrangement of the vehicle wheels.
2. What is the gross weight of the largest load? (No matter how infrequent)
3. What is the height difference between the vehicles and the dock?
4. At what % incline will the dock levelers be used? *Refer to the chart on Page 22 of this guide for a simple reference to determine the % grade.*
5. At what speed are the vehicles travelling?
6. What is the frequency of use?

A simple guideline exists to calculate the safest dock leveler capacity for light to normal usage. Add the gross weight of the vehicle and the gross weight of the load (Fig 1). Multiply that result by 2.5. (i.e. 8,000 lb. forklift gross weight + 4,000 lb. gross load = 12,000 lbs. x 2.5 = 30,000 lb.). This guideline is based on normal usage conditions and frequency. The rated capacity may be adversely affected by unique loading or operating conditions.

If the manufacturer does not offer that exact capacity, use the next higher capacity. For heavier usage applications (increased % grade, higher travel speeds, higher rollover cycles, multi-shift operations), a higher multiplier (consult the factory) needs to be used to determine a capacity rating. Specifying a capacity higher than the calculated requirements will extend the life expectancy of the dock leveler.

Dock levelers are designed to withstand dynamic forces generated when the loading vehicle makes contact with inclined leveler. The impact forces can be many times greater than the actual gross load due to the speed at which it is travelling.

Three-wheeled loading vehicles or narrow wheels greatly increase point loading and should be accounted for by further increasing the leveler capacity. A dock leveler with a *minimum* capacity of 30,000 lb. is recommended regardless of gross load.

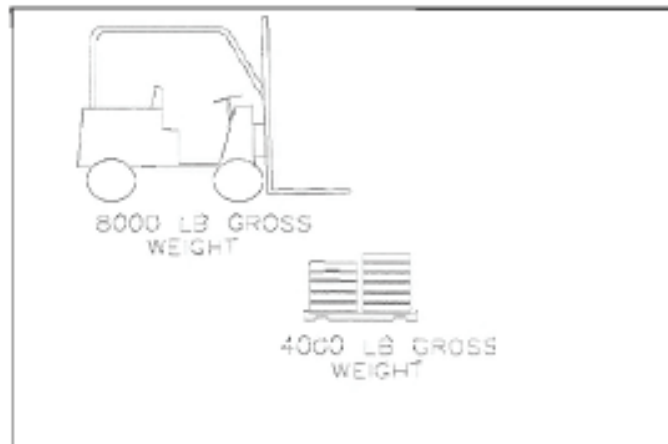


Fig 1 Base information needed to calculate dock leveler capacity

For applications with higher frequencies, greater inclines / declines, lift trucks turning on the leveler and/or higher speeds; apply a higher multiplier to the total gross load. Consult the factory for assistance should you require further advice.

Remember, applications change. Specifying a higher capacity leveler may prove to be of great value in the future as conditions change.

Visit Pentalift's website www.pentalift.com "Understanding Capacities" for more information.

DOCK LEVELERS

OPTIONAL FEATURES

There are many available features for dock levelers that should be considered to ensure the overall effectiveness of the installation.

Increased Lip Length

Dock levelers are normally supplied with a 16" lip plate that will suit the majority of applications. Lip length can be increased to 18" to 20" or even longer on special hydraulic dock levelers. A longer lip projects out further from the dock face. Increased lip projection is necessary to deal with bumper projections of more than 4", substantial dock and truck bed height differences and setback internal truck beds - typical with refrigerated trucks/trailers (Fig 1). As an example, a dock leveler with a 16" lip and 4" bumpers installed leaves a 12" section of lip to project into and onto the vehicle bed. Careful consideration must be given to whether or not this lip length will project far enough into the truck so that setbacks or other conditions do not complicate the loading/unloading operations.

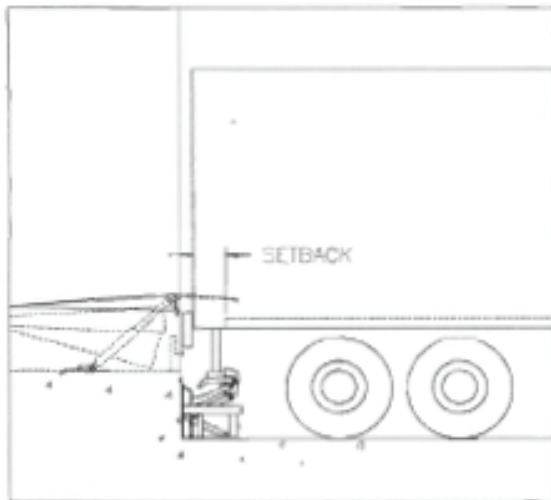


Fig 1 Setback internal truck bed

When loading/unloading a truck/trailer with a setback internal truck bed, the lip must be sized to ensure sufficient lip penetration onto the internal truck bed. Should the lip not project over the internal setback and rest on the step below the internal truck bed, the material handling equipment will strike the edge of the step up to the bed on every trip into and out of the

truck/trailer. This will make product transfer both rough and inefficient. Further, it can create a safety concern.

Side / Rear Weatherseal

Strips of neoprene are attached along the sides and/or rear of the deck assembly to improve climate control through the reduction of internal and external air exchange. Brush seal is another type of weatherseal. It is the preferred weatherseal when vermin entry into the facility is a concern.

Foam Insulated Decks

A uniform layer of spray foam insulation is applied to the underside of the dock leveler deck. The foam insulation lessens the effects of temperature differences between the outside air and the inside air at the dock. Temperature differences can cause condensation to form on the deck of the leveler, which in turn can make the leveler deck slippery. This option is not economically justifiable based on reduced heating or cooling costs. It is generally justified on the basis of improved loading dock safety due to the reduction of the slippery conditions that can result on the leveler platform due to condensation.

Galvanising

Hot dip galvanising is a process used to achieve the optimal finish. The individual leveler components are galvanised before assembly for total protection. This option is common for facilities that handle corrosive substances or are located near a harsh environment such as salt water. Food processing plants also specify galvanised dock levelers due to the presence of corrosive fatty acids and the need for frequent wash downs.

Easy Sweep Design

Easy Sweep levelers are mainly utilized in the food industry when contamination is a concern. It facilitates the cleaning or wash down of the pit. Another method of assuring easy pit cleaning is utilizing a self-supporting open pit design or the selection of a vertical storing dock leveler (see pages 27 & 28).

Consult a Pentalift Sales Representative for dock leveler selection and guaranteed satisfaction. Filling out the attached survey will help us recommend the best solution.

PENTALIFT DOCK LEVELER INFORMATION SURVEY

Form filled out by: _____ of (Company Name) _____

Phone: _____ Fax No.: _____ Date completed: _____

Form filled out for (Company name) if different from above: _____

Contact name at this company: _____ Phone: _____ Fax: _____

<u>Lift Truck(s) Details</u>	<u>Largest Truck Details</u>	<u>Other Trucks</u>	<u>Other Trucks</u>	<u>Other Trucks</u>
Rider (R) or Walk behind (W)	_____	_____	_____	_____
Quantity	_____	_____	_____	_____
Capacity	_____	_____	_____	_____
Gross truck weight including any attachments	_____	_____	_____	_____
Maximum load weight	_____	_____	_____	_____
Maximum speed (mph)	_____	_____	_____	_____
Across dock leveler	_____	_____	_____	_____
Average speed	_____	_____	_____	_____
Tire type - Solid (S) Pneumatic (P)	_____	_____	_____	_____
Inches from load centreline to front axle centreline	_____	_____	_____	_____
4 Wheel or 3 wheel truck	_____	_____	_____	_____
Propulsion type - Manual (M) Electric (E)	_____	_____	_____	_____
Internal Combustion (C)	_____	_____	_____	_____

Loading Dock Details

If all docks are the same, just fill out the first column. Use other columns when other dock details are different.

Quantity	_____	_____	_____	_____
Dock height (difference in inches from dock floor to finished outside grade)	_____	_____	_____	_____
Truck bed heights to be serviced:				
Maximum	_____	_____	_____	_____
Minimum	_____	_____	_____	_____
Average	_____	_____	_____	_____
Inside Truck Widths				
Maximum	_____	_____	_____	_____
Minimum	_____	_____	_____	_____
Would wider dock leveler (6.5 - 7 ft) help? (Y/N)	_____	_____	_____	_____
Truck approach to dock?				
Incline (I) Decline (D) Level (L)	_____	_____	_____	_____
Will fork trucks be turning on top of leveler (Y/N)?	_____	_____	_____	_____

What is "Float" (change in inches in truck bed height as truck suspension compresses and raises due to the weight of lift truck and load driving in and out of truck across dock)? Maximum _____ Average _____

Are Air Ride suspension equipped vehicles to be loaded/unloaded using the dock levelers? _____

Is there complete certainty that the air will be purged (dumped)? _____

Facility Type Warehouse _____ Factory _____ Truck terminal _____ Other _____ (explain)

Do different docks service different situations? (i.e. different truck heights or extra heavy loads) (Y/N explain) _____

Could different docks service specific different situations? (Y/N explain) _____

Other comments: _____

Present loading docks (if any)

Quantity of leveler(s) required _____ Quantity of leveler(s) presently installed at same site _____

If there are levelers presently installed, supply information below:

	Unit to be replaced	Other Units
Manufacturer name	_____	_____
Model	_____	_____
Pit Width	_____	_____
Pit depth	_____	_____
Capacity	_____	_____
Hydraulic (H) Mechanical (M)	_____	_____
Voltage (if hydraulic)	_____	_____
Structural condition Good (G) Okay (O) Bad (B)	_____	_____
Construction details - lip length	_____	_____
Lip thickness (inches)	_____	_____
Hinge spool diameter	_____	_____
Deck thickness	_____	_____

Additional comments: Why deck failed? _____

DOCK LEVELERS

VERTICAL STORING DOCK LEVELERS

As its name indicates, this design of dock leveler is vertical when in the stored or parked position (Fig 1). When servicing a trailer, it is lowered at a controlled rate until it rests on the bed of the trailer. After the loading/unloading operations are finished, the operator activates the raise button to bring the leveler back to the vertical (stored) position. For additional safety the leveler is stored with the lip extended leaning back in an over centered position. The leveler design incorporates a double acting cylinder to safely power up and down the dock leveler eliminating the need for a manual lock and release system. The Auto Stop feature will arrest the deck movement and sound an audible alarm if the control buttons are released before the deck is on the truck / trailer or in the stored position.

Two styles of installation are used for these levelers:

1) Individual Pit

An individual pit is poured usually 10" deep (Fig 2). The pit is designed to allow the overhead doors to close to reduce air loss gaps and access for vermin entry (horizontal levelers leave gaps between the pit walls and the leveler). When compared to a continuous pit installation, an individual pit installation makes the floor space more accessible between the dock leveler pits. Bumper risers should be used to ensure bumper contact with the trailer. Pit width should be given consideration to reduce the pinch point potential when the unit is lowering.

2) Continuous Pit

When a row of vertical storing levelers are installed (Fig 3), it may be beneficial to make a full width recessed ledge along the dock. Forming a recessed ledge is less expensive than individual pits and cleaning of the dock is made easier. One disadvantage with a continuous pit installation is that there is a drop off area created between the levelers. This type of installation also eliminates the temporary storage area between levelers.

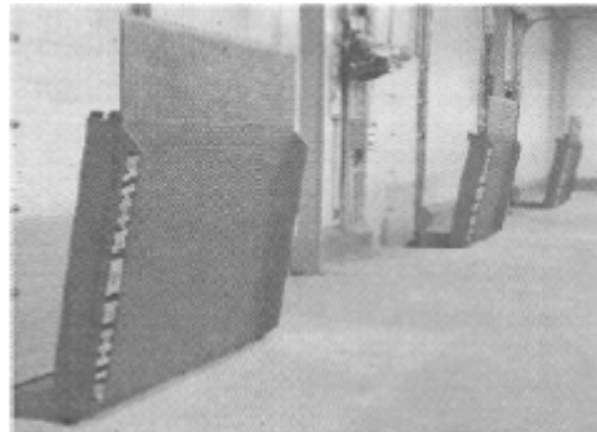


Fig 1 Vertical Storing Dock Leveler

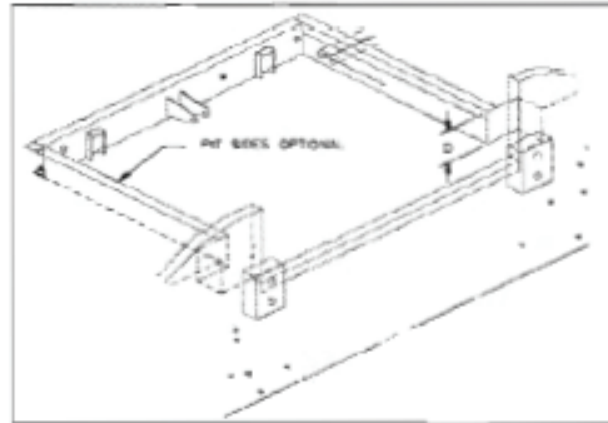


Fig 2 Individual pit installation



Fig 3 Continuous Pit

DOCK LEVELERS

Determining the size and capacity required for a vertical storing leveler is much the same as for conventional dock levelers.

Vertical Storing Levelers are generally specified with nominal lengths of 5' or 6'. This is due to the amount of space that they take up inside and outside the building. 8' long units and specials are available. Capacities range from 25,000 lb. to 50,000 lb.

It is standard to equip the units with 4" high runoff side guards along the length of both sides. This will increase the safety of the loading/unloading operation.

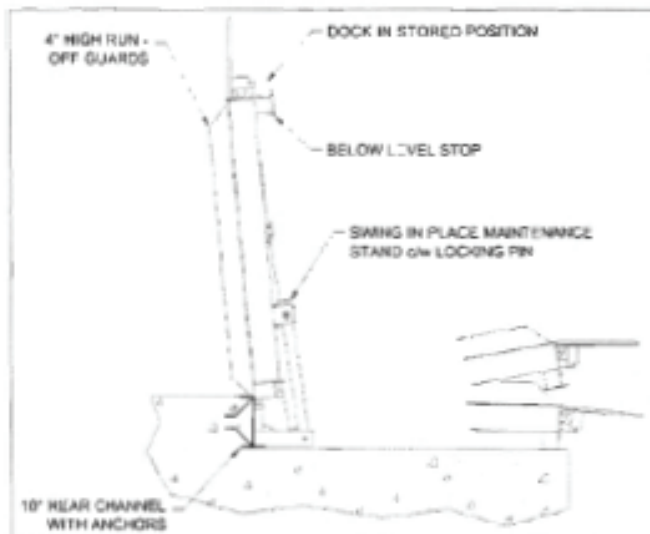


Fig 1 Side view-Vertical Storing Dock Leveler

Vertical Storing Levelers are commonly used for food storage or processing facilities. An individual pit or a continuous pit installation makes it easy to keep the dock area clean and maintain standards. The overhead doors can be closed and secured down to the concrete surface (Fig 2) resulting in better climate control, security, and reduced access by vermin and insects.

Efficiency can also be increased with these levelers. Since they are set back from the dock face, the trailer can be positioned and then the hinged trailer doors ("barn style") opened. This eliminates the need to manoeuvre, get out to open the doors, and the position the truck / trailer at the dock.

When the overhead door is closed and the leveler is in the vertical position, it acts as a roll off barrier as well as a visual barrier. Consequently, the overhead doors are protected against damage from loading vehicle impacts.

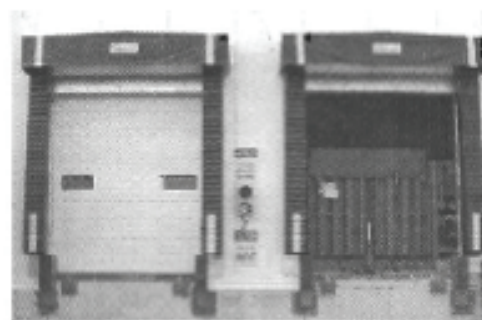


Fig 2 Open overhead door shows Vertical Storing Dock Leveler in the stored position. Door on left is closed down to base of pit

For more information or assistance in selecting the proper equipment for your application, contact a Pentalift Sales Representative.

EDGE OF DOCK LEVELERS

One of the alternatives to recessed pit style dock levelers is an Edge of Dock Leveler. Edge of Dock Levelers are mounted to the face of the loading dock. They are a practical, safe, and an economical alternative to dock plates or pit levelers if the height difference between the dock and trailer bed is minimal. Edge of Dock Levelers are limited in their ability to service variances in trailer height. Additionally, with the proliferation of "Air Ride" equipped trucks / trailers the Edge of Dock Leveler is less applicable. It is not recommended to use an Edge of Dock Leveler for height differences of more than 2" above or below the dock level.

Edge of Dock Levelers are available in standard capacities to 30,000 lb. Some manufacturers may build higher capacity units; it is recommended to use recessed pit dock levelers in high capacity applications to ensure safety and equipment longevity.

There are two actuating methods available for Edge of Dock Levelers: mechanical (Fig 1), or hydraulic (Fig 2).

Common widths for Edge of Dock Levelers are 66" wide and 72" wide. Selection of width is based primarily on the loading method of the products. The 72" wide models offer the most flexibility for loading.

Note: Use of manual hand pallet carts with even a 2" height difference between the dock and trailer can be difficult. When using an Edge of Dock Leveler with a manual handcart product transfer, the dock and trailer should be the same level.

For more product information, request the Pentallift Edge of Dock brochure D002

DOCK LEVELERS

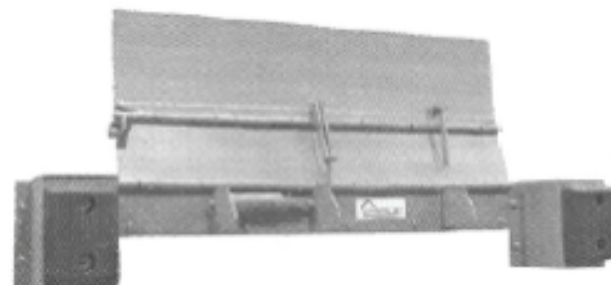


Fig 1 The Pentalever Mechanical Edge of Dock Leveler is positioned by means of a built-in lever which raises the platform and extends the lip when operated. The Edge of Dock Leveler is then lowered down onto the trailer bed. After the trailer departs, the Edge of Dock Leveler retracts into its lowered position behind the bumpers.

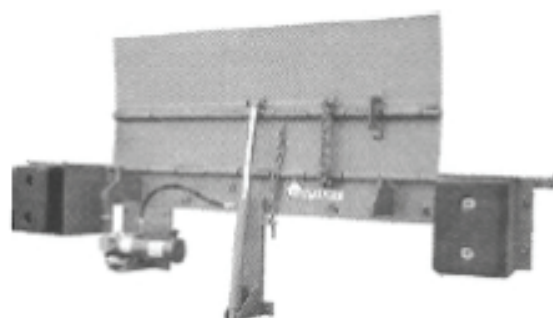


Fig 2 Hydraulic Edge of Dock Leveler is activated by the operator depressing the control button to raise the platform and lip. The lip automatically extends. Once fully extended, the operator releases the button and the unit lowers to rest on the trailer bed. After trailer departure, the Edge of Dock Leveler unit retracts to its stored position.

DOCK BUMPERS

Each dock must be equipped with a type of dock bumper to protect the building from vehicle impact damage. Keep in mind that an approaching vehicle can generate up to 300,000 lb. of impact force. Several styles of bumper are available to suit application requirements.

In addition to the impact forces, when a truck/trailer is in position at a dock, the dock bumpers are continually affected by the friction and abrasion created when the truck/trailer body rubs up and down against the bumpers. This friction and abrasion are especially significant with "Air Ride" equipped vehicles.

Larger sized dock bumpers and steel faced bumpers (Fig 3) are recommended to effectively deal with these conditions.

For typical level approach applications, bumper projection should be specified at not less than 4". For recessed docks or special applications, additional projection or build-out boxes may be required.

Shown here are the most common style of dock bumpers- molded rubber (Fig 1) and laminated rubber (Fig 2)

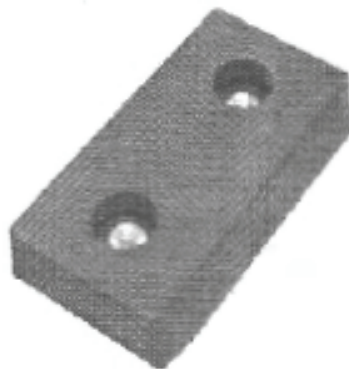


Fig 1 Molded rubber bumper with lag bolt holes

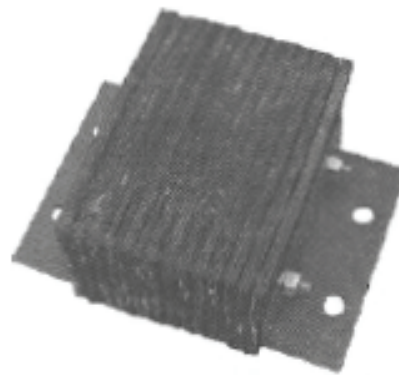


Fig 2 Fabric reinforced rubber pads, laminated and secured between steel angles

Steel face bumpers are used for high frequency or heavy impact applications, or where jockey trucks are used for trailer positioning (Fig 3). A steel plate face on the bumper offers protection against the unusual wear and biting out of the rubber created by these operations.

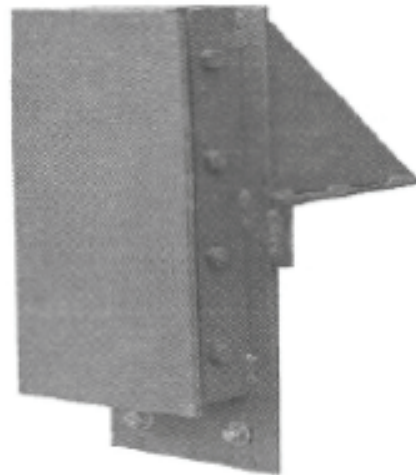


Fig 3 Steel face, laminated dock bumper

Note: Steel face bumpers should be specified for any installation with truck levelers (see Truck Levelers section Page 44). *Steel face bumpers are highly recommended for docks servicing "Air Ride" suspension trucks / trailers*

VEHICLE RESTRAINT SYSTEMS

Earlier in this guide, attention was focused on vehicle restraints (*Safety First*). Proper selection of a restraint is as important as recognising the need itself.

A vehicle restraint system involves more than the piece of hardware installed at the loading dock. An important part of an effective vehicle restraint installation is the communication system and its components. The communication system provides information to both the truck driver and the dock attendant. The exterior lights and signs tell the truck driver when it is safe to pull away from the loading dock. The control panel for the restraint tells the dock attendant whether the vehicle at the loading dock is securely held against the dock.

FACE-MOUNT VEHICLE RESTRAINTS

A common style of vehicle restraint is a facemount design (Fig 1). Acting on the trailer's R.I.G. bumper, it is an effective means of restraining the majority of the trucks / trailers.

- 1) Prevent premature trailer departure
- 2) Restrict truck / trailer movement to keep the extended lip of the dock leveler in place on the floor of the truck / trailer
- 3) Reduce the chance of the landing gear collapsing

When selecting a face-mount vehicle restraint, it is important to consider the operating range required, restraining capacity, the flexibility needed to adapt to the wide variety of truck / trailer R.I.G. bumpers and the capacity to respond to the "float" associated with the loading / inloading. The "float" issue is of special significance for Air Ride equipped vehicles.

The restraint must also be designed to withstand the environment in which it is installed. Typically, the installation location of the vehicle restraint is one of the harshest and least maintained in the facility.

The normal operating range for a vehicle restraint is typically from 12" to 30".



Fig 1 Face-mounted vehicle restraint

For facilities which service trailers with unusually low or high R.I.G. bumpers, contact a Pentalift Sales Representative to determine the best restraint solution for this type of application

VEHICLE RESTRAINT SYSTEMS

OPERATION STYLES

Face-mount vehicle restraints are available with various operating mechanisms.

In most cases, the restraining arms of vehicle restraints are positioned by an electro-mechanical or an electro-hydraulic operating device. These types of vehicle restraints typically require that a control panel be installed adjacent to the loading dock door opening. Powered restraints offer the potential to inter-connect the restraint with a powered dock leveler, a safety barrier and/or an overhead door.

The Pentalock HFR32 is shown to the right (Fig 1).

Restraints are also available which are positioned manually by the dock attendant who uses a "T" bar to both engage and disengage the restraining arms of the restraint.

Irrespective of the type of restraint installed at a dock, it is imperative that the operation - the engaging / disengaging of the restraint is easy and uncomplicated. A simple to use vehicle restraint will facilitate the regular use of the restraint by the dock attendant.

Face-mount vehicle restraints are easily installed and maintained. Since these restraints are externally mounted and easily installed, they also are readily relocated if necessary.

The Pentalock MFR32 (Fig 2) is a manually operated mechanical vehicle restraint. It features a rugged structural design for reliable performance. It is easy to operate. The MFR32 is easily installed and requires no electrical hook-up.

Pentalift's MFR32 is an effective and economical way to enhance loading dock safety.

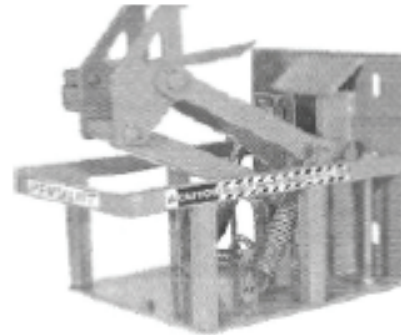


Fig 1 The Pentalock HFR32 can be inter-connected to other loading dock equipment



Fig 2 Dock attendant using the "T" bar to operate the Pentalock MFR32

ULTRAHOOK VEHICLE RESTRAINT SAFETY SYSTEM

The restraining mechanism of the Ultrahook Vehicle Restraint System is recessed into the dock face and mounted under the dock leveler (Fig 1). There are no protruding components when the restraint is in its stored position. The advantages of this mounting style include:

- 1) Greater operating range (down to 6" from ground)
- 2) Easy snow/debris removal
- 3) Restraint is protected from outside elements
- 4) Vehicles and restraint are not damaged by impact forces
- 5) No gap between the R.I.G. bumper and the restraining arms (Fig 2)
- 6) Higher restraining capacity

The draw bar rating of the Ultrahook is 40,000lb.

For more information request Pentalift Product Bulletin D022.

VEHICLE RESTRAINT SYSTEM

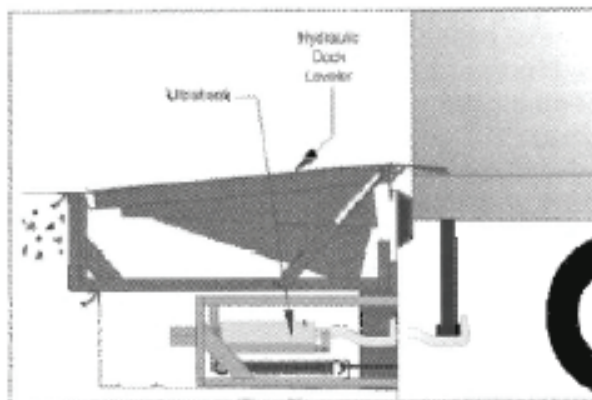


Fig 1 The Ultrahook is available to fit pit sizes from 64"+ in length

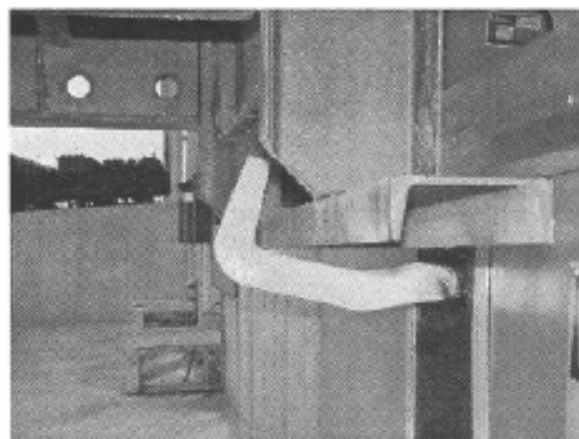


Fig 2 No gap between the R.I.G. bumper and the Ultrahook's restraining arms

VEHICLE RESTRAINT SYSTEMS

COMMUNICATION LIGHTS

Communication light packages are standard features with most manufacturers' powered vehicle restraints, and are important factors in the overall safety of the loading dock. If the communication system is not a standard feature offered by a particular manufacturer then it should be requested as an optional item.

A two-way communication system consists of: an outside signal light, one regular and one reverse image instruction sign (Fig 1), an interior control panel, and a sign indicating to the operator to load/unload on the green light only (Fig 2).

Two-way communication packages are standard with Pentlift's electro-hydraulic vehicle restraint safety systems.

A vehicle restraint should also incorporate an interlock feature to tie it to the operation of a hydraulic dock leveler. If the vehicle is not restrained, the dock leveler cannot be activated. If the vehicle does not have an R.I.G. bumper or it is impossible to restrain it, the dock personnel uses an override switch to allow the hydraulic leveler to function. The vehicle wheels should be restrained by another means and precaution should be taken when loading/unloading.



Fig 1 Outside signal lights and signs



Fig 2 HFR32 control panel and interior sign

SEALS/SHELTERS

The purpose of installing dock seals or shelters is to maintain the internal climate of the facility and protect against product damage.

Use of these products has many benefits such as:

- 1) **Efficiency** - Seals and shelters improve the loading dock environment. Worker morale and productivity are related directly to the work place environment and its safety.
- 2) **Return on Investment** - The dock seal/shelter can pay for itself in a matter of months with the cost savings it generates in energy retention.
- 3) **Merchandise Protection** - Protects valuable products against damaging heat, cold, rain, snow and wind. Minimises vermin entry.
- 4) **Safe Working Conditions** - Keeps weather out; eliminates rain, ice and snow from loading areas, improving dock safety.
- 5) **Energy Savings** - Reduces heating and cooling costs by maintaining interior temperature control.
- 6) **Security** - Helps to eliminate pilferage of goods and unauthorised entry into loading/unloading areas.
- 7) **Increased Storage Capabilities** - Positioned trailers at a loading dock can become secure, temperature-controlled extensions of the facility.

Dock shelters are applicable to virtually any size door but generally are installed on doors from 9' wide x 9' high to 12' wide x 12' high.

Pentalift manufactures custom-sized units to suit the requirements of the application.



Fig 1 Adjustable curtain dock seals

SELECTION CRITERIA

The first and most important aspect of successful dock seal/shelter installation is proper selection. Improper consideration of the selection criteria not only results in a poor installation, but can lead to damage and reduced efficiency.

The following criteria must be considered:

- 1) Configuration of trucks / trailers to be sealed
- 2) Grade of approach
- 3) Size of the overhead door
- 4) Dock bumper projection
- 5) Dock height
- 6) Seal / shelter mounting surface.

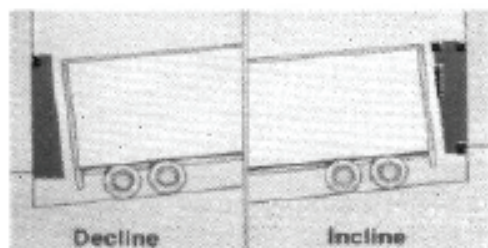
Configuration of Trucks / Trailers to be Sealed

Dimensions to consider are:

- 1) Normal width of trucks / trailers serviced
- 2) Normal height of trucks / trailers serviced
- 3) Truck / trailer bumper projection
- 4) Normal truck / trailer bed heights.

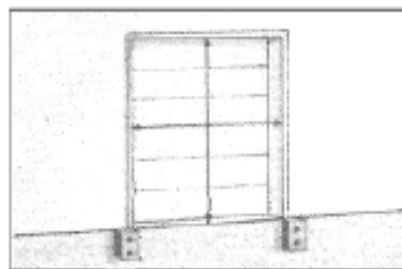
Note: If there are trucks / trailers to be serviced with dimensions that are greatly different from normal, they should also be considered.

Grade of Approach - Is the approach level, declined, or inclined?

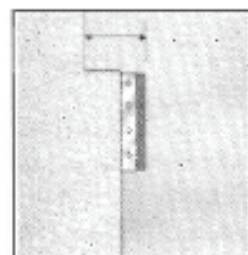


If required, seals can be tapered to ensure parallel compression along the entire face of the side pads, thereby creating an effective seal.

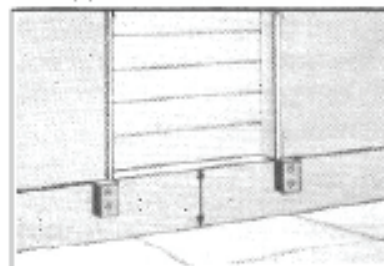
SEALS/SHELTERS



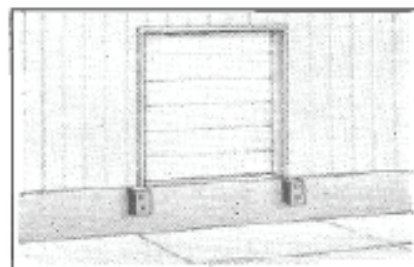
Size of Overhead Door to be Sealed - The size of the door opening determines the most suitable model of seal or shelter to be installed.



Dock Bumper Projection - The difference in inches from the face of the wall on which the seal will be mounted to the front face of the dock bumper. On declined approaches, the bumper projection must be sufficient to eliminate the potential of truck / trailer impact on the upper wall above the door.



Dock Height - The difference in the height of the dock from the finished grade to the top of the dock floor.



Seal / Shelter Mounting Surface - The strength and type of wall construction may determine the style of seal / shelter to be specified. Inflatable dock seals / shelters are best suited for applications where the wall is not designed to accept higher compression forces typical with conventional seals or shelters. Consideration of wall obstructions such as canopies, light fixtures, etc. is essential.

SEALS/SHELTERS

SIZE SELECTION

When specifying dock seal/shelter sizes, keep in mind one goal: effectively sealing the majority of vehicles that will be serviced at the loading dock.

In most cases, it is not practical to install a variety of dock seal configurations to accommodate the uncommon trailer sizes. For that reason, it is important to ensure that what is specified will seal the majority of vehicles.

The first step is to determine the size of trailer that frequents the loading dock most.

Generally, the most common trailer will be approximately 13' 6" high from ground level and have an outside trailer width of 96" to 102".

A standard goal is to maintain the inside seal opening at 90" to 96" wide, the height at approximately 12' to 13', and the clear door height at a minimum of 96".

Projection of the dock seal should be sized to allow 4" to 6" of seal compression before the trailer contacts the bumper. Projection of dock shelters typically ranges between 18" and 24" to allow sufficient trailer penetration.

A Pentalift Sales Representative can assist you with seal/shelter selection and answer other dock related questions.

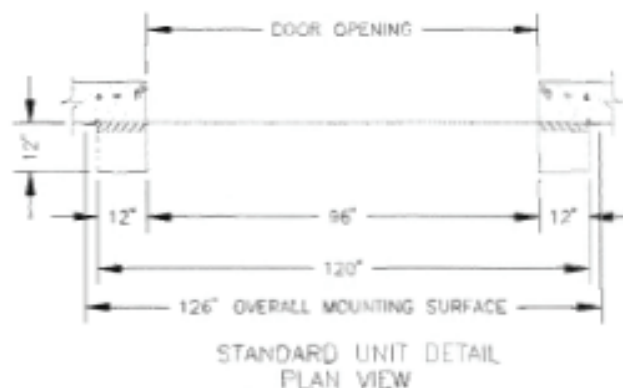


Fig 1 Dock seal for an 8' wide door. Side pads can be beveled to close the door opening down or to accommodate wider doors.

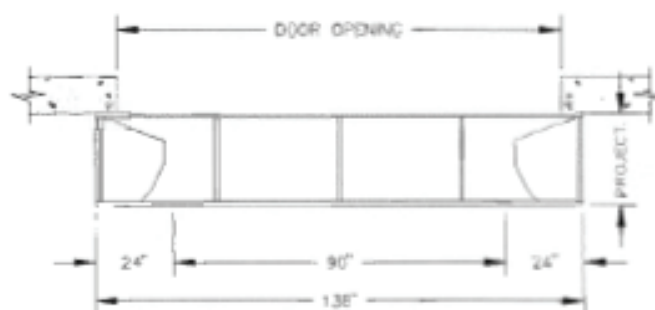


Fig 2 Dock shelter for a 10' wide door. For dock shelters the opening should be closed down to 90" wide x 96" to 102" high to allow sufficient vehicle penetration.

For ease of selection and best results, use the dock survey form on the following page and consult a Pentalift Sales Representative.

For product information request the Pentlift Dock Seal and Shelter brochure D006.



DOCK SEAL/SHELTER SITE CHECK SHEET

ORDER # _____

SITE CHECK BY: _____ DATE: _____

SOLD TO _____ PROJECT: _____

SITE ADDRESS _____ CITY: _____

QTY OF SEALS/SHELTERS _____ ALL DOORS SAME SIZE? ☐ YES ☐ NO IF NO THEN A SEPARATE CHECK SHEET PER DOOR IS REQUIRED.

LEVELER ORDER # _____ LEVELER MODEL _____ BUMPER MODEL _____

BUMPER RISER ☐ NO ☐ YES SIZE _____" BUMPER EXTENSIONS ☐ NO ☐ YES SIZE _____"

Diagram illustrating the dimensions and components of a dock seal/shelter installation.

Labels and dimensions include:

- DISTANCE TO NEXT DOOR/WALL
- DOOR JAM HEADER FACE WIDTH
- DOOR JAM FACE WIDTH
- DOOR FRAME MATERIAL: ☐ BLOCK ☐ STEEL ☐ PRECAST ☐ WOOD ☐ OTHER
- DOOR WIDTH
- DOOR HEIGHT
- MARK ANY OBSTRUCTIONS TO THE SIDES AND ABOVE DOORS
- CLEARANCE ABOVE
- ABOVE DOOR FLUSH? ☐ YES ☐ NO IF NO: ☐ PROJECTION ☐ RECESS
- FOUNDATION FLUSH? ☐ YES ☐ NO IF NO: ☐ PROJECTION ☐ RECESS
- BUMPER PROJECTION
- PROJECTED FOUNDATION
- RECESSED FOUNDATION
- HAUNCH/PROJECTED PIT/CANTILEVER _____" WIDE x _____" HIGH x _____" PROJECTION

DOCK HEIGHT _____"
BOLLARDS: DISTANCE FROM MOUNTING SURFACE _____", DISTANCE BETWEEN _____",
CENTERED TO DOOR ☐ YES ☐ NO, IF NO SUPPLY SKETCH

WALL MATERIAL TO TOP OF DOOR ☐ Block ☐ Precast ☐ Siding ☐ Freezer Wall ☐ Other _____"
Wall Depth _____" (specify)

WALL MATERIAL ABOVE DOOR ☐ Block ☐ Precast ☐ Siding ☐ Freezer Wall ☐ Other _____"
(specify)

MOUNTING SURFACE BEHIND INSIDE WALL ☐ Steel ☐ Wood ☐ Other _____"
(specify)

Diagram illustrating the slope and grade requirements for the dock seal/shelter installation.

Labels and dimensions include:

- RISE _____" = _____% GRADE
- RUN _____"
- DECLINE (SLOPES TOWARDS BUILDING) ☐ DECLINE
- LEVEL ☐ LEVEL
- INCLINE (SLOPES AWAY FROM BUILDING) ☐ INCLINE
- MEASURE OUT FROM DOCK
- RUN 25 ft AND 50 ft

NOTE: PHOTOS MUST BE TAKEN TO PROCESS ORDER: ATTACH TO SITE CHECK SHEET
NOTE: SITE CHECK SHEET MUST BE FILLED OUT COMPLETE TO PROCESS ORDER

DOOR AND DOCK SURVEY FORM

TRUCK/APPROACH INFORMATION

Approach: Level _____ Decline _____ Incline _____

Obstructions _____

Special Notes _____

Frequency of Use

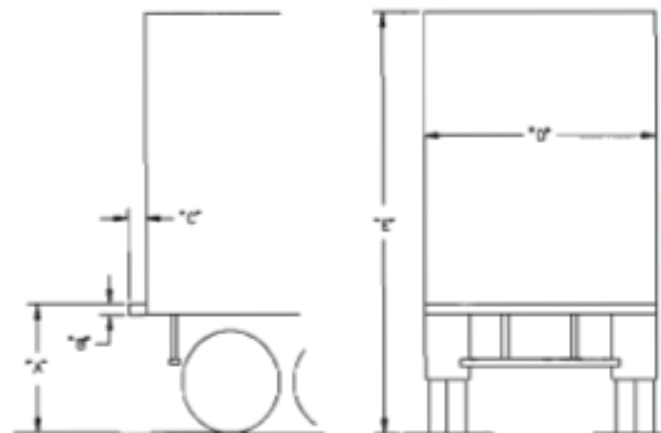
Once a Day or Less _____

Two to Five Times a Day _____

High Usage _____

Note Any Special Trucks/Uses _____

Truck Data



DIMS: A _____ B _____ C _____

D _____ E _____ Avg. Length _____

CALCULATING INCLINE/DECLINE

You Will Need: 1. String or line 60' long 2. Line Level 3. Tape Measure

STEPS

- Have customer (or use something heavy) hold end of line on top front edge of dock.
- Measure out three feet from dock and begin taking height measurements, holding line level with the dock height. This is actual "Dock Height."
- Fill in height measurements at five foot intervals until the chart is complete. You will be approximately 53' from the dock upon completion of the chart.
- The difference between your first height measurement and your last, at 53', is your incline or decline in inches.
- Now apply our formula to figure projection differential. (Convert ALL dimensions to INCHES).

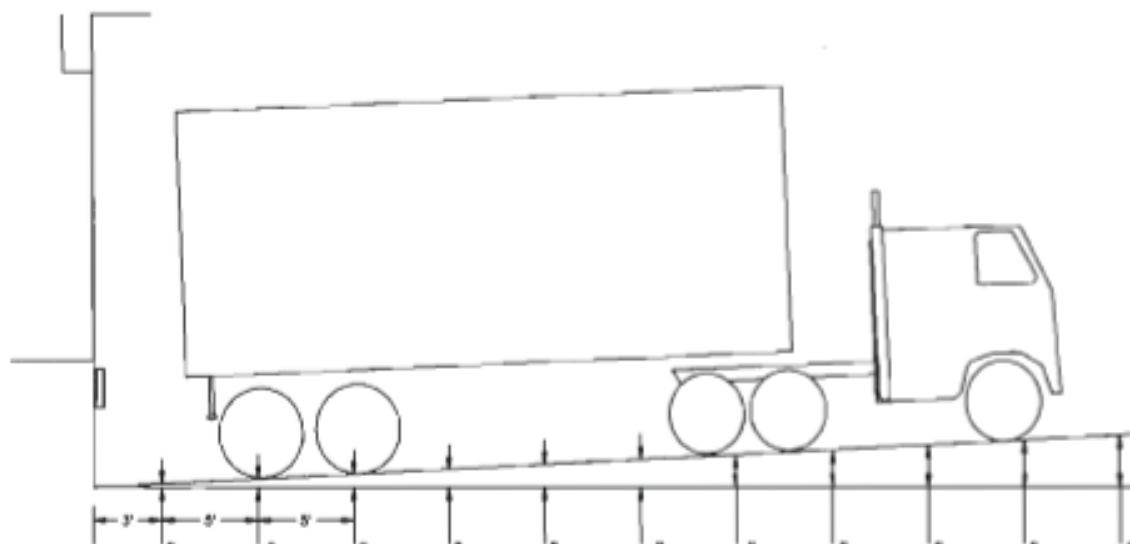
FORMULA: $\text{RISE/RUN} \times (\text{DOOR HEIGHT} + 6) = \text{Difference in Projection Top to Bottom.}$

EXAMPLE: Rise: 18" Run: 53' Door Height: 9'

$$18/536 \times (108 + 6) = x$$

$$.028 \times 114 = 3.19"$$

Use 3" less projection at the top and you will have a uniform CRUSH of the seal.



FILL IN COMPLETELY
(Every Five Feet - Starting Three Feet Out From Dock)

ENERGY LOSS ANALYSIS

For Loading Dock Doors

Determine the following for each doorway

Actual Door Size _____ w x _____ h = _____ square feet

Non sealed door size _____ door size (sq. ft.) x .20 = _____ total - non sealed door square feet

Average wind speed _____ miles per hour x 88 = _____ feet per minute (FPM)

Total non-sealed door size (in sq. ft.) _____ x _____ FPM = _____ cubic feet per minute (CFM)

Temperature Differential (TD) _____ - _____ = _____ °F (TD)

(Average indoor temperature - average outdoor temperature - Consult National Weather Service if unsure)

Determine heat loss:

_____ CFM x 1.08 x _____ TD = _____ BTU's per hour

_____ BTU's per hour x _____ hours per day door is open = _____ daily BTU loss

*1.08 is a constant based on air temperature of 70°F and .075 pounds per cubic foot density. As the temperature area's density increases, the constant will be higher than 1.08; for example at 15°F the value should be approximately 1.29.

Convert BTU's to determine cost of heat loss

Natural gas _____ BTU's per day ÷ 100,000 = _____ Therms (cost factor/Therm)

Electricity _____ BTU's per day ÷ 3,415 = _____ kWh (cost factor/KWH)

Heating oil _____ BTU's per day ÷ 144,000 = _____ Gal. Per day (cost factor/Gal.)

_____ Amount used x _____ cost per day = \$_____ (cost per day per opening)

Determine payback

Cost per day per opening _____ x Number of days per week _____ x Number of weeks per year _____

= Total energy loss for one year \$_____

To calculate actual yearly savings

Multiply total energy loss by .30. This result is an adjusted yearly savings based on an "average" dock seal properly installed on an exterior loading dock door.

Total energy loss \$_____ x .30 = adjusted yearly savings \$_____

Now divide installed cost of unit \$_____ by adjusted yearly savings \$_____ = _____ payback in years.

Not included in above calculations:

- Reduced employee absenteeism
- Reduced pilferage of materials and tools
- Reduced product spoilage due to weather
- Reduction in dust, bugs, birds and rodents



ELEVATING DOCKS

A simple and flexible means of accommodating vehicle height variations is the installation of a hydraulic elevating dock (Fig 1). Elevating docks can be built in virtually any size and capacity required for the application. They provide the ability to service trucks at any height and can also offer access to ground level for fork trucks. Pit mounted elevating docks are capable of height adjustments between 0" and 60". Their only disadvantage is that they must cycle up and down every trip into and out of the trailer. Consequently, they are less efficient than an dock leveler installation. To address this concern greater efficiency can be achieved by specifying an elevating dock wide enough to allow side-by-side pallet loading. (See Page 42, Fig 2)

It is common for an elevating dock to be installed into a three-sided pit, recessed into the dock wall (Fig 1). When the elevating dock is in its lowered position at grade, the overhead door, when closed, will not be in contact with the elevating dock platform creating a building security concern. Specifying swing-out night stops that hold the elevating dock platform at floor level is one way to address the concern.

Keep in mind two requirements for a three-sided pit installation. First, the guard rails are to be floor mounted at the sides of the pit to provide a barrier when the elevating dock is in its lowered position. Second, a post needs to be installed on the elevating dock platform as a stop for the bridge plate. Additionally, the guard rails are to be positioned to allow sufficient clearance for the operation of the overhead door.

An alternative to a three-sided pit installation is to install the Elevating Dock at the face of the dock.

Elevating docks are also available in a Low Profile design (Fig 2) to facilitate ground to truck loading/ unloading without the requirements to construct a pit. A Low Profile Elevating Dock rests on the surface. It is most beneficial in avoiding the cost of pit construction.

ELEVATING DOCKS

A Low Profile Elevating Dock is only 6" above grade when in its lowered position. This low height facilitates the movement of loads on or off the elevating docks platform, over the approach ramp, typically using a hand pallet truck.

When incorporating an elevating dock into the overall dock design, it is important to choose a unit that will offer the greatest flexibility for the loading operations.

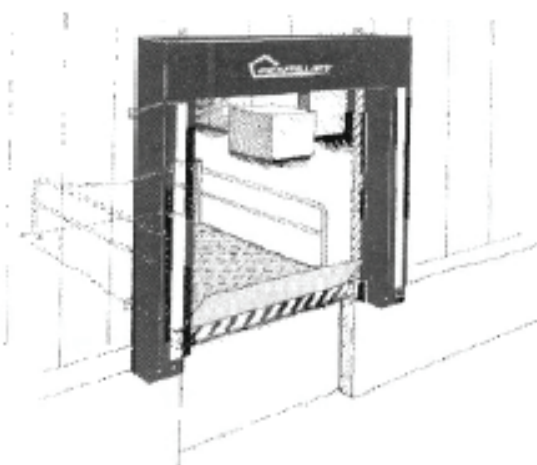


Fig 1 Three-sided pit Installation



Fig 2 Low Profile Elevating Dock

ELEVATING DOCKS

Consider these factors when selecting an elevating dock:

1) Platform size. It is essential to ensure there is sufficient room on the platform to accommodate vehicle/product turning radius and overall length. Determine the required radius needed to manoeuvre the loading vehicle when loading/unloading product. This should be the basis for selecting platform size (Fig 1). Side-by-side pallet loading onto the elevating dock will increase the efficiency of the operation. Two pallet loads are placed onto the platform and then positioned for loading or unloading (Fig 2). One trip can achieve what would otherwise take two. However, the platform must be wide and long enough to accommodate this type of loading.

Common platform sizes range from 72" wide x 96" long to 96" wide x 144" long. Larger and smaller sizes are available. Consult a Pentalift Sales Representative.

2) Lifting Capacity. Capacity selection for elevating docks is straightforward, but should be given careful consideration. Elevating docks are not subject to dynamic loads like dock levelers. The elevating dock must be capable of lifting the total gross load of the vehicle and product. For applications of higher frequency such as 20 times per day, it is recommended to overrate the capacity to prolong the unit's life. If side-by-side pallet loading is a possibility, the capacity should be determined based on the heaviest possible load. Make sure the unit selected offers axle load capacity respective to the axle loading characteristics of the vehicle. Some vehicles may have an axle load that is the equivalent of 80% of the gross load. Capacities are available from 3,000 lb. to 25,000 lb. and higher.

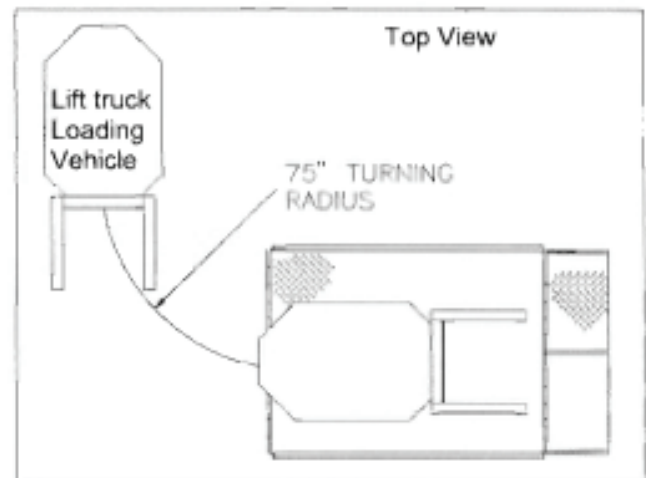


Fig 1 Loading vehicle turning radius. A vehicle with loads that requires a 75" turning radius will need an 84" wide platform size to allow access without damage to equipment and product.

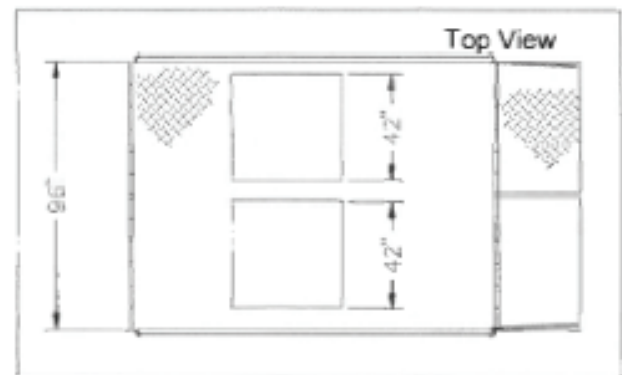


Fig 2 Side-by-side pallet loading. A 96" wide platform will accommodate most side-by-side pallet loading operations.

3) Lifting Speed. The speed is determined by the size and capacity of the elevating dock and the size of the power unit. Power units are available with various horsepower ratings. Selecting a small power unit to save money can result in a substantial loss of efficiency by reducing the lifting speed. Specify the desired speed at which the lift is to operate. The time recommended for full lift is 20 - 30 seconds. Lowering times should also be considered but these are not dependent on the horsepower rating of the power unit.

For further information, request a Pentalift Elevating Dock product brochure D008.

COMBI-DOCKS

COMBI-DOCKS

Another means of achieving complete height flexibility and maximising efficiency is to utilise a combi-dock.

In its simplest form, a combi-dock is a hydraulic dock leveler mounted on an elevating dock. Its design and operation are more complicated and its initial cost is usually greater than a dock leveler or elevating dock. The cost, however, can be justified by combining two functions into one location.

When servicing truck trailers that are level or close to the same height as the loading dock, the unit is operated as a dock leveler (Fig 1). Hydraulically-actuated locking pins secure the frame into position with the deck level to the dock surface. Once secured, the unit operates as a hydraulic dock leveler allowing maximised loading/unloading efficiency.

When servicing very high or very low trailers, or when access to ground level is required, the unit can function as an elevating dock (Fig 2). The hydraulic locking pins are retracted, allowing the scissor lift to raise or lower to meet the trailer bed height. The unit must be raised or lowered for each load transfer as is the case when loading / unloading using an elevating dock.

Use of a telescopic lip plate allows ease of operation for both dock leveler and elevating dock functions. The lip extends directly out from the deck without the need to swing out like a dock leveler. This increases efficiency and allows greater flexibility for end loading applications.

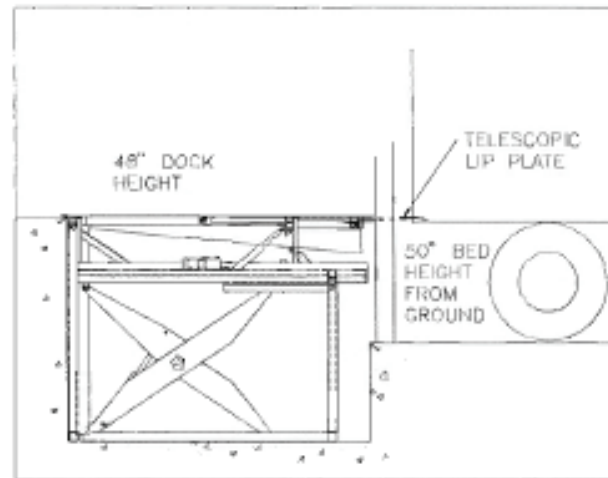


Fig 1 Combi-Dock being used as a dock leveler

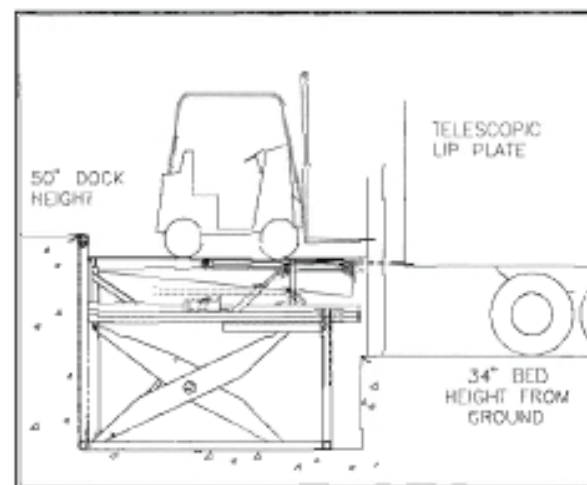


Fig 2 Combi-Dock in use as an elevating dock

Contact a Pentlift Sales Representative for more information and assistance in selecting the proper loading dock equipment.

TRUCK LEVELERS

When efficiency must be maintained at all docks, installation of a truck leveler is recommended. This allows the operator to adjust the height of the trailer in relation to the dock. Two standard designs are available: pit-mounted or surface-mounted.

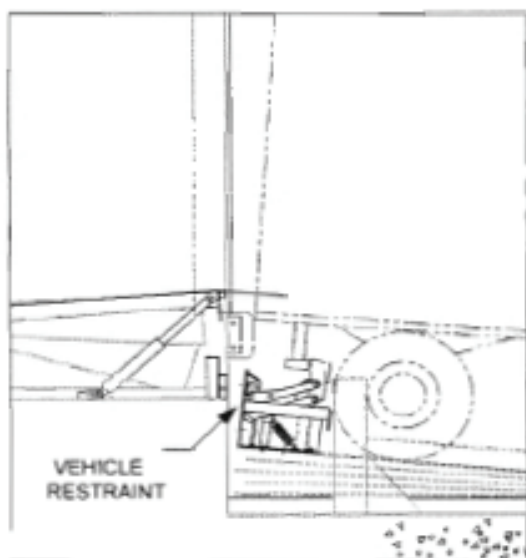


Fig 1 Surface-mounted truck leveler

Surface-mounted truck levelers allow up to 30" above level positioning (Fig 1). They are mounted on a concrete base in front of the dock face and can be relocated to another dock area if necessary. Side-mount hydraulic cylinders can be used to position the deck assembly.

The length of the truck leveler and the mounting position are essential factors to consider. Improper consideration can cause unsafe loading conditions or damage the loading dock equipment.

TRUCK LEVELERS

Once the trailer bed is positioned at the loading dock floor height, the truck leveler can be cycled and loading/unloading carried out safely and efficiently. Truck levelers can also be equipped with deck-mounted vehicle restraints for increased safety. The electric activation also allows safety interlock features to other loading dock equipment.

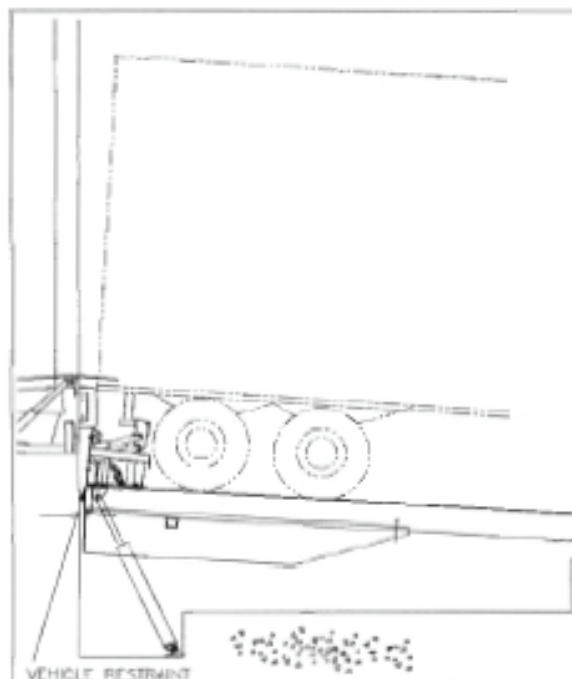


Fig 2 Pit-mounted truck levelers are capable of above and below grade level positioning

Pit-mounted units offer the greatest flexibility by accommodating height variations above and below the dock. They are also well suited for applications where side-by-side loading dock doors are closer together, since the cylinders are mounted in the pit, directly under the deck assembly.

The site details for the location where the Pentalift Truck Leveler will be installed are to be recorded on a Truck Leveler Guide Form. Consult the factory to request the form and to obtain further information to assist with the selection of the truck leveler.



METRIC CONVERSION FACTORS

Please use these conversion factors to convert to metric (SI) measurement.

Factors for converting to metric units of measure:

LENGTH

1 inch =	2.54 centimetres
1 foot =	0.304 metres
1 yard =	0.914 metres
1 mile =	1.609 kilometres

AREA

1 square inch	=	6.45 square centimetres
1 square foot	=	0.092 square metres
1 square yard	=	0.836 square metres
1 square mile	=	2.589 square kilometres

CAPACITY

1 pint (US)	=	0.473 litres
1 quart (US)	=	.946 litres
1 gallon (US)	=	3.785 litres

VOLUME

1 cubic inch	=	16.387 cubic centimetres
1 cubic foot	=	0.0283 cubic metres
1 cubic yard	=	0.764 cubic metres

WEIGHT

1 ounce =	28.249 grams
1 pound =	0.453 kilograms

Pentalift is a World Class Provider of Rugged & Reliable Dock Equipment.

We make more dock-related products than anyone else we know ...and we make them **better**. Five major plant expansions since 1983 attest to our dedication to 100% customer satisfaction and to our expertise in the loading dock field. Trained professionals provide consultation, sales and follow up service to guarantee the most effective dock installation. Put the Pentalift advantage to work for you.

Pentalock HFR32 Vehicle Restraint Safety System



Pentalever Mechanical Edge Of Dock

Safe, Economical Alternative to Dock Plates



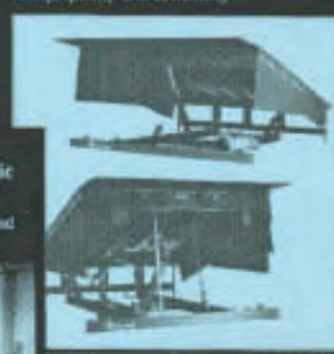
Pentalift Vertical Storing Hydraulic Dock Leveler

Safety, Cleanliness, Versatility, Convenience, and Energy Savings all in one design



Loading Dock Systems

Setting new standards in loading dock safety, quality and reliability



Pentalift Loading Dock Equipment

The Most Complete Line Of Quality Loading Dock Equipment From A Single Source Manufacturer



Inflatable Dock Seals and Shelters



Dock Seals and Shelters

Conventional and Inflatable



Ultrabook UHR40 Vehicle Restraint Safety System

The Ultimate Vehicle Restraint Safety System



Pentalift Elevating Docks

For Unusual and Low Profile Driveway Docks



Consult a Pentalift Sales Representative for additional information or equipment recommendations

Note: Some photos may reflect products with optional features. All Pentalift Equipment Corporation products are subject to design improvement through modifications without notice.

PENTALIFT EQUIPMENT CORPORATION

PO Box 1510 Buffalo NY U.S.A. 14240-1510

PO Box 1060 Guelph ON Canada N1H 6N1

CP 1219 Pointe-Claire QC Canada H9S 5K7

Website: www.pentalift.com

Phone: (519) 763-3625 Fax: (519) 763-2894

Phone: (519) 763-3625 Fax: (519) 763-2894

Phone: (514) 426-0219 Fax: (519) 763-2894

Email: dock@pentalift.com

Product Bulletin 1207D011

Printed in Canada