



# CONVENTIONAL PALLET RACKING

**The most universal system for direct access to every single pallet**





## CONVENTIONAL PALLET RACKING

- Universal system with direct access to every pallet
- Maximizes space available for storage
- Adaptable to any size or weight of pallet
- Increased stock control
- Better service in the warehouse

The conventional pallet racking system offers the best solution for warehouses where a wide range of references need to be stored on pallets.

The wide range of profiles and accessories provides optimal adaptation to each load and height requirement.

A conventional pallet racking warehouse is generally laid out with single-entry racks either side and double-entry racks in the middle.

The width of the working aisle between each rack and the height of the racks depend on the characteristics of the forklifts or handling equipment, the size of the pallets and the height of the warehouse itself.



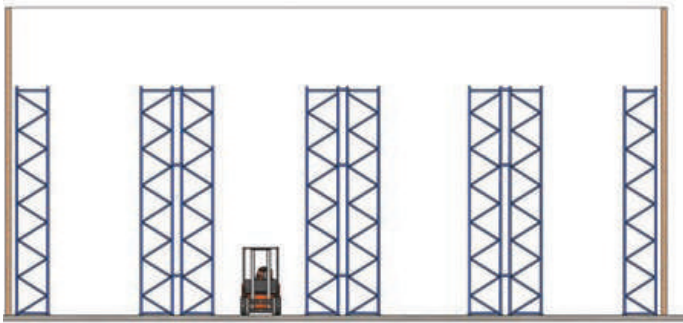


## Double-deep conventional pallet racking

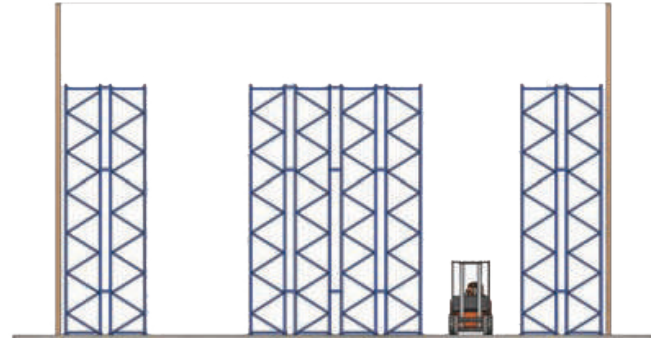
In order to store a greater number of pallets (depending on their weight and the number of pallets per reference) double-deep racks can be installed, enabling one pallet to be stored in front of another on each side of the aisle.

Since direct access is only available for the front pallets, this system is recommended for products with more than one pallet per reference.

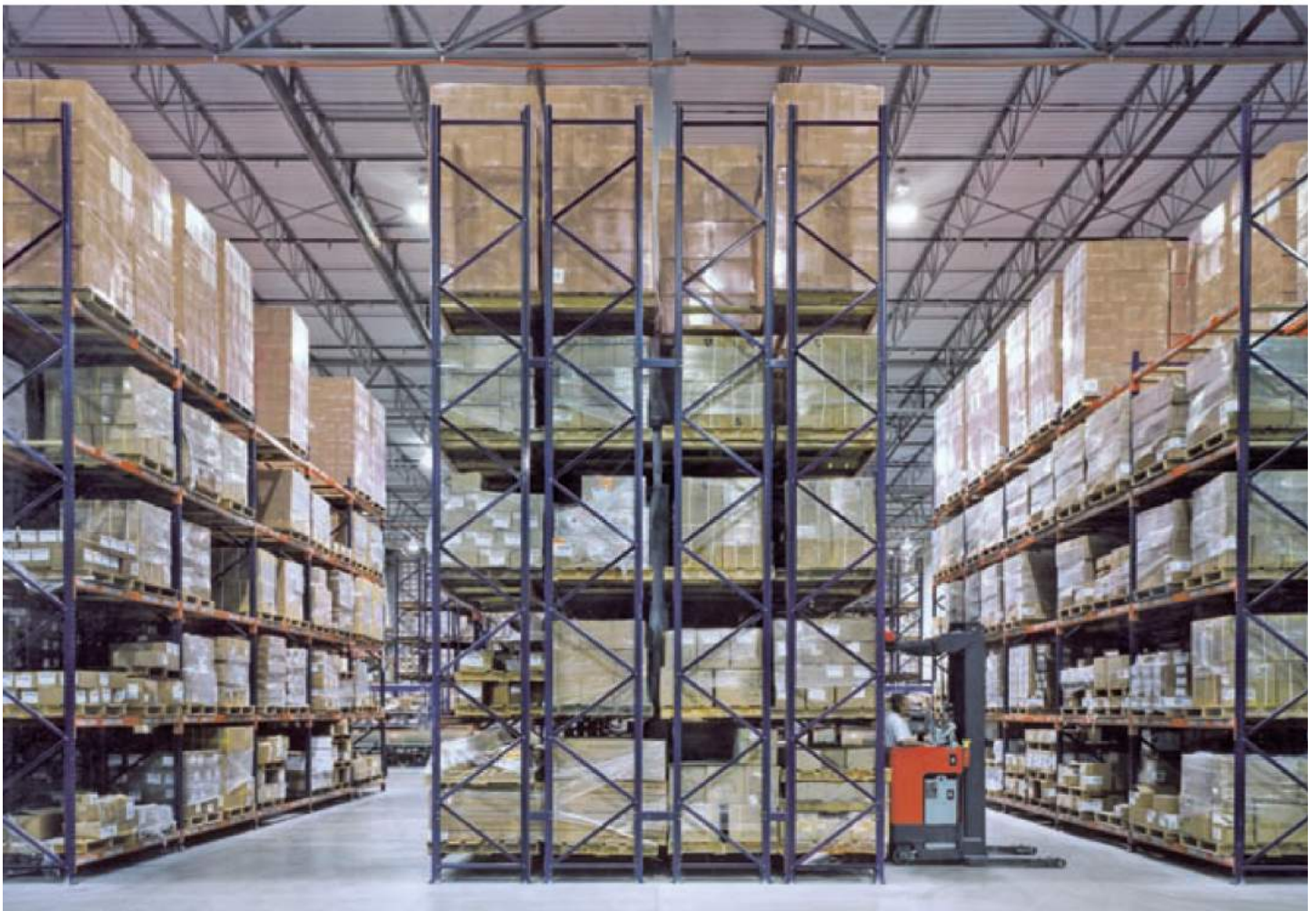
This system requires suitable lifting machinery fitted with double-depth telescopic forks.



The most common conventional system made of a single-entry rack fitted to the wall and double-entry racks in the middle



Double-deep conventional system



## MEASUREMENTS AND CLEARANCE

### Aisle

In order to define the minimum free aisle width between loads it is necessary to ascertain the type and model of forklift truck. This information can be found in the technical specifications of each forklift truck.

As a guideline, for pallets measuring 1,200 x 800 mm, handled by the sides of 800 mm, the following type of lift trucks are used:

### Minimum clearances

Stacker: from 2,200 to 2,300 mm

### Counter-balanced forklift:

from 3,200 to 3,500 mm

### Reach truck:

from 2,600 to 2,900 mm

### Bilateral turret truck:

from 1,500 to 1,600 mm

### Trilateral turret truck:

from 1,700 to 1,900 mm

### Automatic trilateral stacker crane:

from 1,700 to 1,900 mm

### Stacker crane:

from 1,500 to 1,650 mm

### Reach height and clearance

The free height between load levels is obtained by taking into account the total height of the pallet plus the load and adding this figure to the necessary clearance. This should never be less than the figure indicated in the technical rack clearances table.

Reach heights also differ for each type of forklift truck. This information can be found in the technical specifications of each forklift.

### Maximum height:

Stacker: 5,200 mm

### Counter-balanced forklift:

7,000 mm

### Reach truck:

12,000 mm

### Bilateral turret truck:

13,500 mm

### Trilateral turret truck:

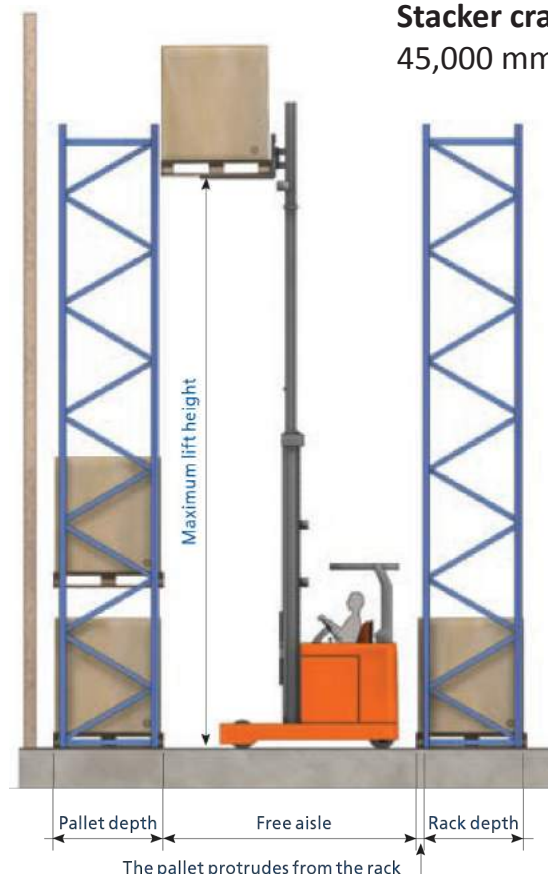
14,500 mm

### Automatic trilateral stacker crane:

14,500 mm

### Stacker crane:

45,000 mm





## THE MOST COMMONLY USED MATERIAL HANDLING EQUIPMENT



Stacker



VNA Man-up turret truck



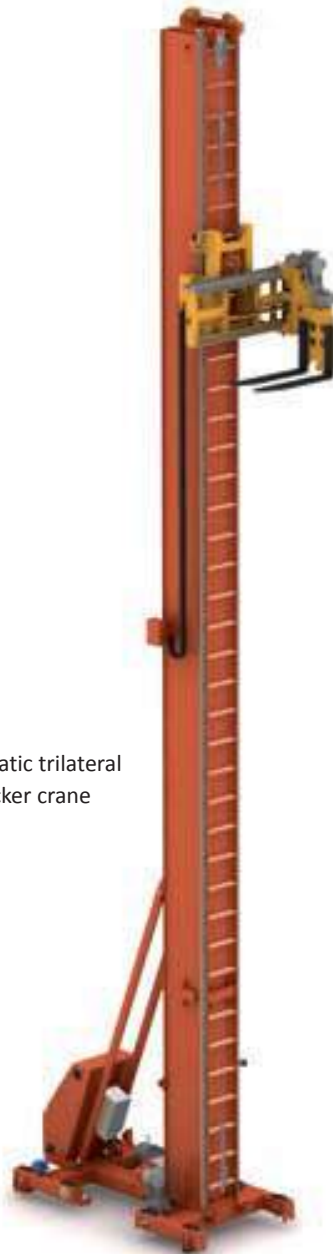
Counter balanced forklift



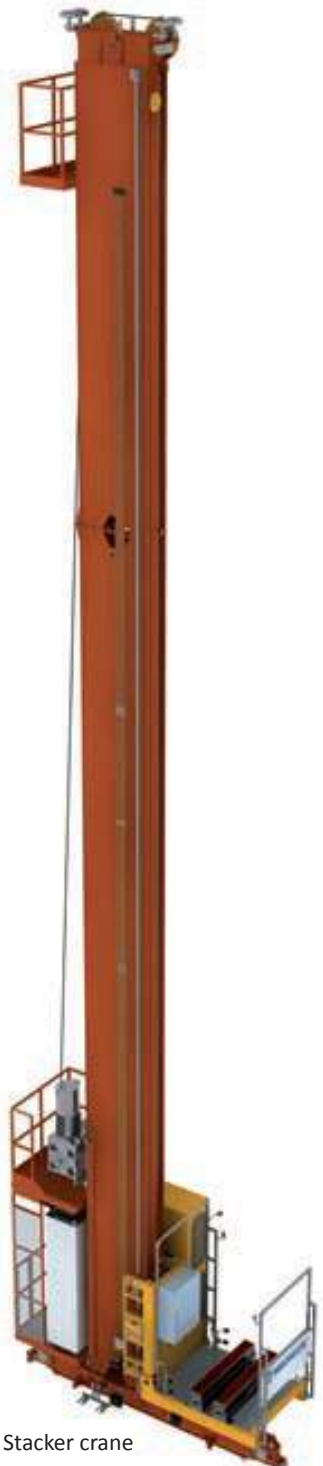
Reach-truck



VNA Man-down turret truck



Automatic trilateral  
stacker crane



Stacker crane



### UNIT LOADS: Pallets and containers

Pallets and containers are elements where the goods to be stored are placed. Their different characteristics determine the way they should be stored.

The most common types are:

#### Europallets

Europallets measure 800 x 1,200 mm and are handled by their narrowest side.

Pallets are also made using the same criteria in sizes of 1,000 x 1,200 mm and 1,200 x 1,200 mm. To support them, they are built with nine blocks and three skids along the base.

#### Perimeter base pallets

These pallets are built in a similar way to Europallets, but they have two additional skids on the base, which are interconnected with the other three.





### **Containers**

Containers for storage are usually made of metal and are built with variable

specifications and sizes. They may require additional components to be used for storage on conventional pallet racking.

### **Other pallets and containers**

In addition to the previously mentioned types, other pallets and containers are also available on the market. These require individual study in order to ascertain the best way to store them.

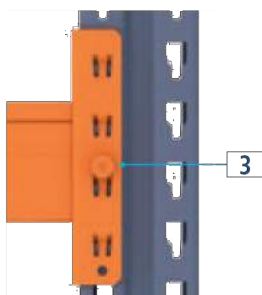
Europallets (800 x 1,200 mm) are normally handled by the narrowest side, since they have three skids running along the base, parallel to the side measuring 1,200 mm. When stored on the racks, these skids rest perpendicular to the support beams.

On occasions, particularly in order to facilitate picking work, they are handled by their wider side (1,200 mm). In such cases, the racks should be fitted with components enabling the pallets to be properly supported (pallet support bars).

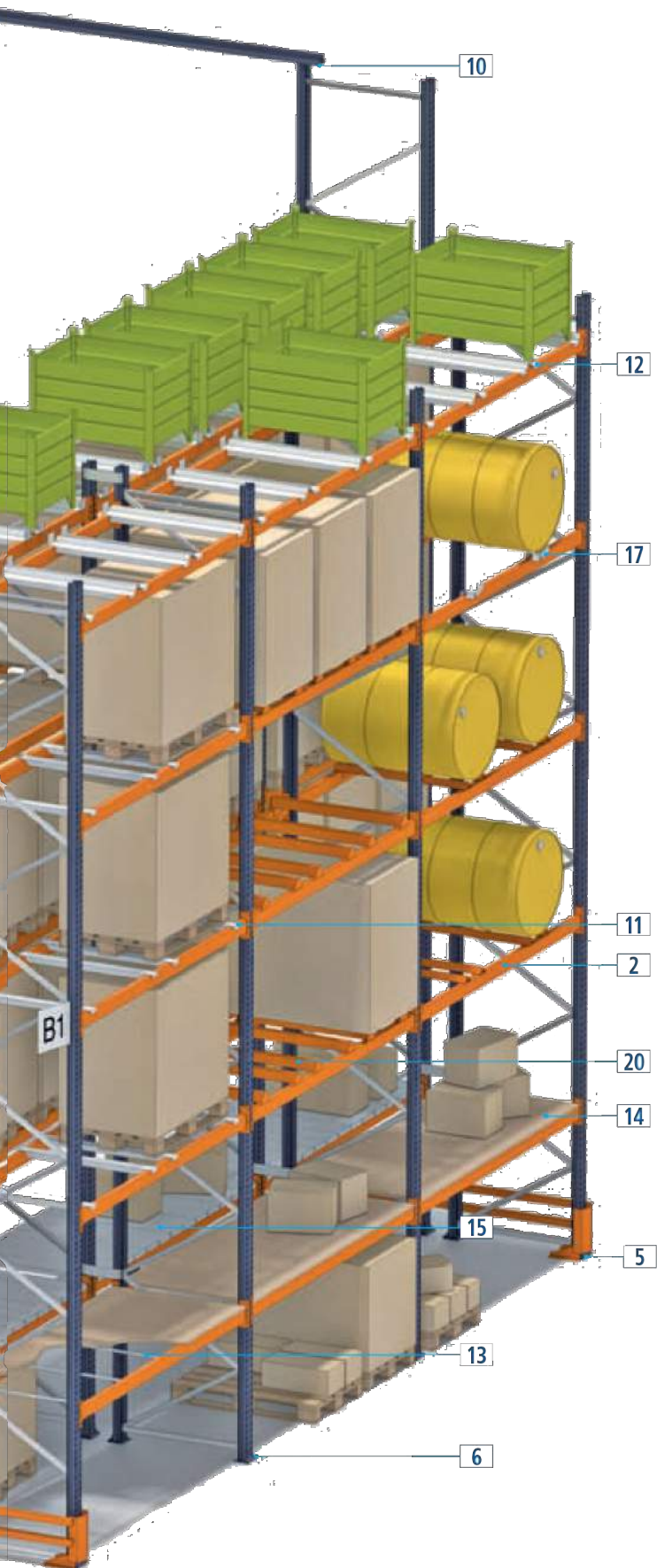


## BASIC COMPONENTS

1. Frame
2. Beam
3. Safety locking mechanism
4. Row spacer
5. Anchor bolts
6. Levelling shims
7. Upright protector
8. Lateral protection barrier
9. Cross bracing set
10. Top portal tie
11. Pallet support bar
12. Container support bar
13. Chipboard deck support
14. Chipboard or melamine shelf
15. Galvanised picking shelf panel
16. Mesh shelf
17. Drum support
18. Back stop rails
19. Fall protection mesh guarding
20. Raised pallet support bar
21. Aisle identification plate
22. Loading sign









## FRAMES

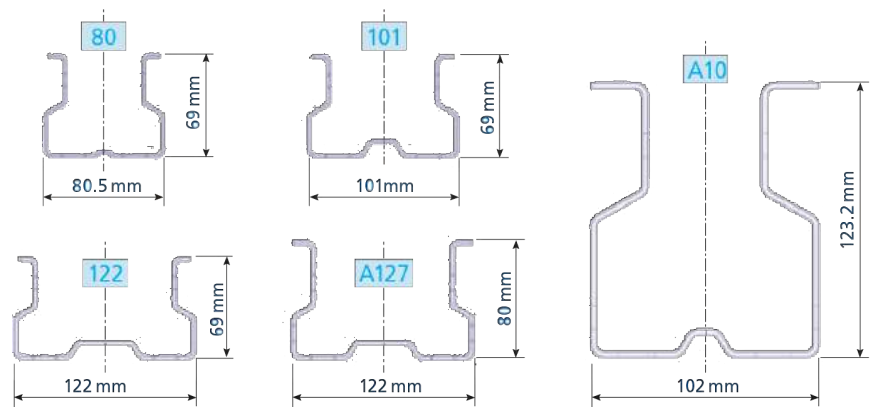
Frames are made up of two uprights with the corresponding horizontal and diagonal bracings, footplates and accessories. They are slotted every 50 mm in order to fit the beams.

The depth of the frame is determined by the size of the pallet. For a Europallet measuring 1,200 mm deep, a 1,100 mm frame is normally used.



### Uprights (1)

The different models, sections and thickness of uprights enable them to be adapted to a wide range of loading requirements.







### Frame footplates (2)

Frams are erected on the floor using foorplates which are fitted to the base of uprtights. There is a range of different frame footplates which use depends on the load to be supported and on the upright model to be used. They are anchored to the floor using one or two anchor bolts.



### Levelling shims (3)

Shims level our racks which stand on uneven slabs. Each type of upright has its own type of shim which comes in different thickness allowing for more precise levelling.



### Anchor bolts (4))

Rackes are fixed to the slab using anchor bolts. They vary depending on the forces they have to whitstand and the characteristics of the slab itself.

### Footplate and shim measurements

Upright	Width-mm	Depth-mm	cm2
80	135	119	160.60
101	155	119	184.40
122	175	119	208.20
127	175	119	208.20
A10	determined by the load		

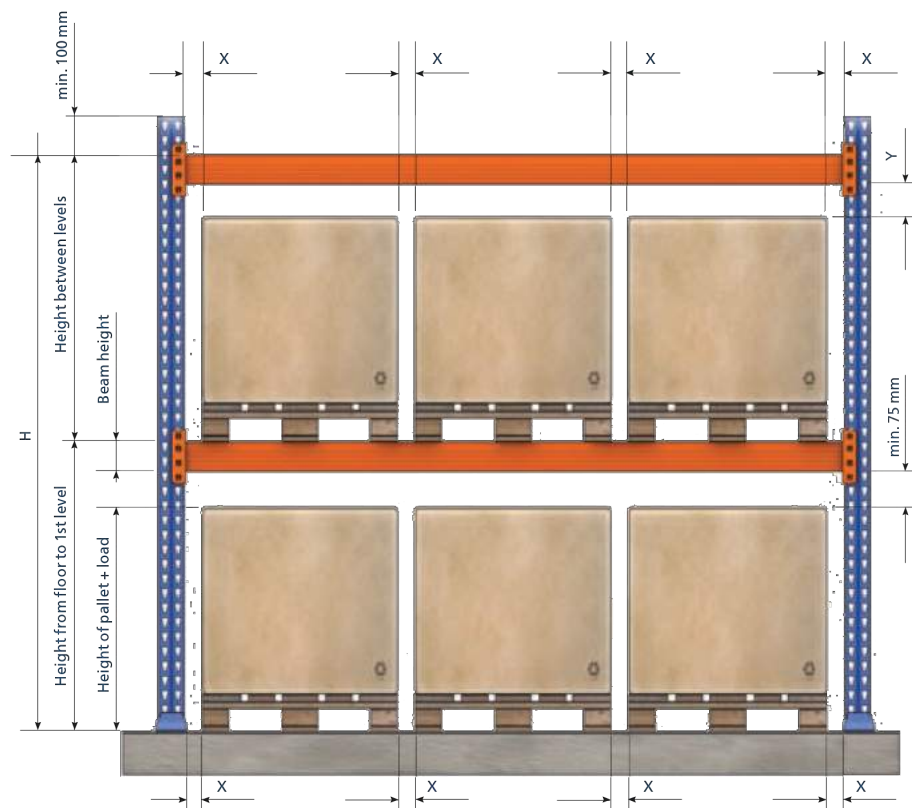






## Frame footplates (2)

The height between levels is calculated by adding together three variables: the pallet height, including the load, the beam height and the clearance (Y). These values are rounded up to a measurement that is a multiple of 50 mm.



## Bay tolerances and clearances:

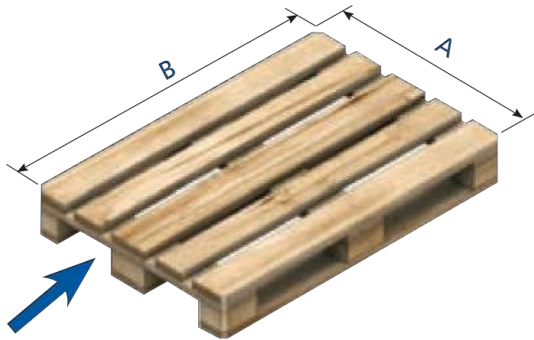
Y: height between the pallet and the bottom of the beam for levels other than the bottom level

X: minimum clearance between pallets or loads

Dimensions in mm

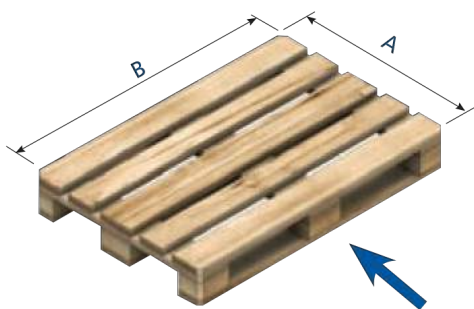
For levels between:	Class 400		Class 300A		Class 300B	
	X	Y	X	Y	X	Y
$0 \leq H \leq 3,000$	75	75	75	75	75	75
$3,000 < H \leq 6,000$	75	100	75	75	75	100
$6,000 < H \leq 9,000$	75	125	75	75	75	125
$9,000 < H \leq 12,000$	100	150	75	75	100	150
$12,000 < H \leq 13,000$	100	150	75	75	100	175
$13,000 < H \leq 15,000$	–	–	75	75	100	175





Beam measurements in mm (up to 9,000 mm high)

Pallet		Beam	
A	B		
800	1,200	1,825	
1,000	1,200	2,225	
1,200	1,200	2,625	
800	1,200	2,700	
1,000	1,200	3,300	
1,200	1,200	3,900	



Beam measurements in mm (up to 9,000 mm high)

Pallet		Beam	
A	B		
800	1,200	2,625	
1,000	1,200		
1,200	1,200		
800	1,200	3,900	
1,000	1,200		
1,200	1,200		



Frame depth measurements

Pallets handled by the narrow side	Pallet measurements	Pallets handled by the wide side
D = 1,100	800 x 1,200	D = 800
D = 1,100	1,000 x 1,200	D = 1,000
D = 1,100	1,200 x 1,200	D = 1,200



## Beams

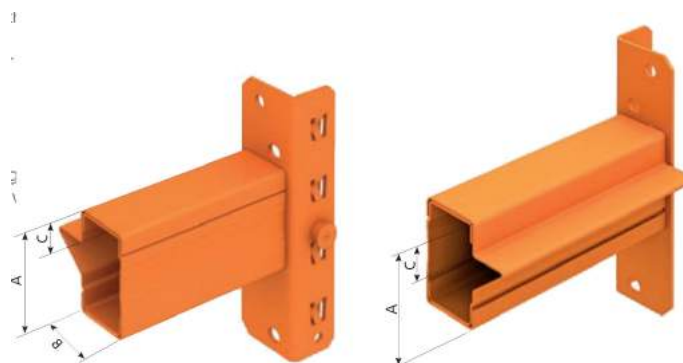
Beams are the horizontal and robust components of the racks upon which loads are deposited. They are joined to the uprights via connectors or endplates, which fit into the slots on the upright.

The hooks on these endplates, in the connecting system are joined to the main body at both ends. This considerably increases load capacity and prevents deformations that typically occur when the connection between the main body and the hooks or endplate is not sturdy enough.

As such, our connector system reduces the possibility of the beam falling, which could occur if it began to prise open due to fatigue. Each beam has two safety devices built in, to prevent accidental dislodgement. There is a wide range of beams covering different needs both in terms of their size, as well as load type and capacity. The measurements of the load levels are determined by the number and size of the pallets stored.



### Tubular beams



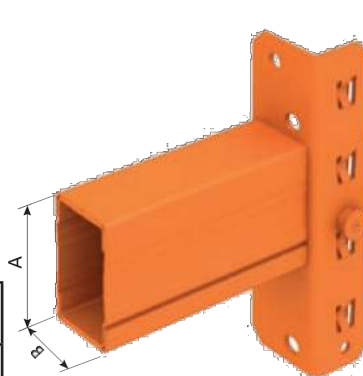
Model TB	Height /A/	Width /B/
<b>TB 80</b>	<b>80</b>	<b>50</b>
<b>TB 100</b>	<b>100</b>	<b>50</b>
<b>TB 120</b>	<b>120</b>	<b>50</b>
<b>TB 130</b>	<b>130</b>	<b>50</b>

Dimensions in mm

### Beams for pallets

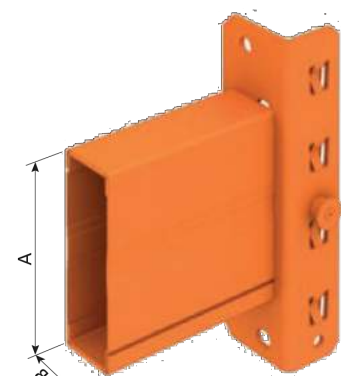
There are eight standard models classified into two families distinguished by the size of the connections or endplates.

Model 2C-S	Height /A/	Width /B/
<b>1115</b>	<b>110</b>	<b>50</b>
<b>1315</b>	<b>130</b>	<b>50</b>
<b>1515</b>	<b>150</b>	<b>50</b>
<b>1615</b>	<b>160</b>	<b>50</b>
<b>1718</b>	<b>170</b>	<b>50</b>



#### 2C-S beam-1115

Made up of 2 C-shaped profiles fitted into each other and welded to the endplate.



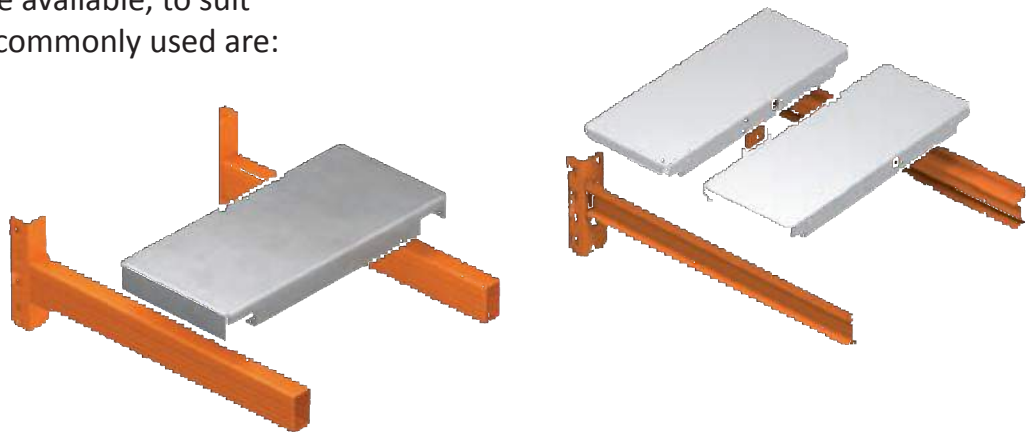
#### 2C-S beam

**1315,1515,1615,1718**  
These beams are used for heavy loads and longer lengths due to their strength.



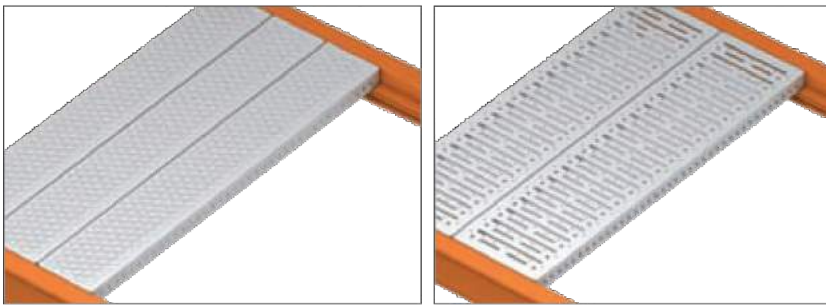
## Shelves

Different types of shelves are available, to suit any requirement. The most commonly used are:



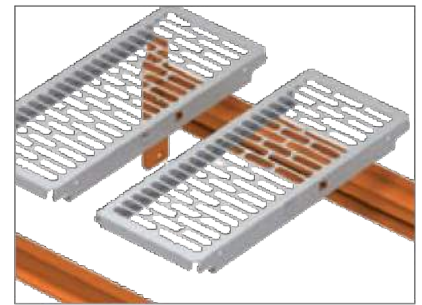
### L-2C galvanised shelves

Metal shelves which, depending on the storage requirements, can be placed on tubular or 2C beams. They fit directly on top of the beams and do not require further securing.



### Galvanised picking shelves

A combination of metal shelf panels are used with ZS-60 beams. The lips and flanges of the shelf panels are used to fit them together to create a full width shelf.

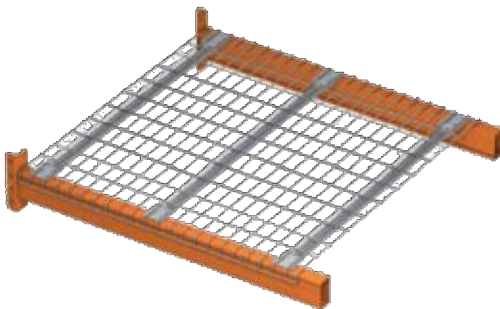




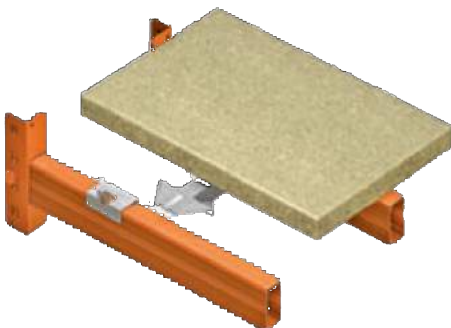


### Mesh shelves

Mesh shelves are made up of rectangular electro-welded mesh supported on deck supports, which strengthen the structure. They are always fitted on 2C beams and do not require further securing.

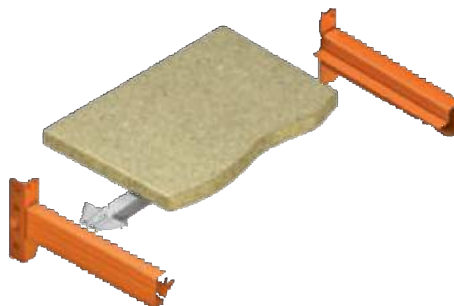


### Chipboard shelves



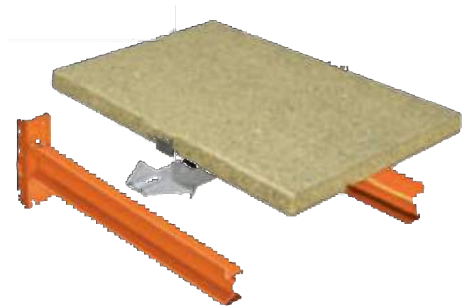
### 2C Beams

Chipboard shelves can be fitted on tubular or 2C beams, and secured using four retainers. Chipboard deck supports can also be used.



### J or Z Beams

Chipboard shelves do not require brackets to be fitted on J or Z beams, as the edge of the shelf is hidden and supported on the beam profile. Chipboard deck supports may be required depending on the load.



### Chipboard deck supports and Z TAM clamps

Chipboard deck supports can be added to increase the shelf load capacity where required. Z beams with chipboard shelves exceeding  $\geq 1,900$  mm in length must be fitted with one Z TAM clamp per beam.



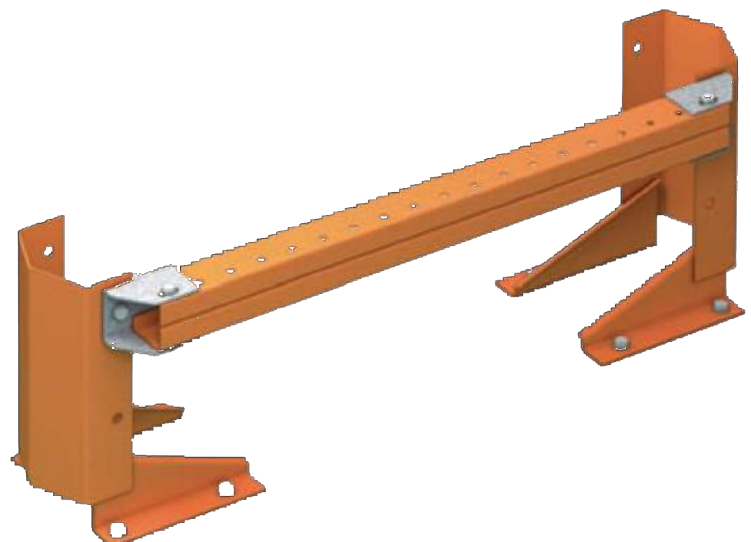


### **Protectors**

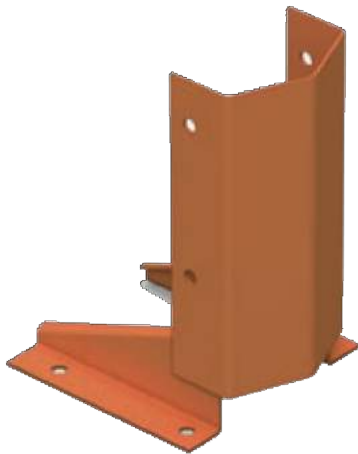
These protect racks from light impacts that may occur at floor level, preventing damage to the vertical elements.

### **Lateral frame protection**

These protect the side of the rack at the bottom. They are normally fitted to end frames and in passageways between frames where impacts are most likely. Each upright type has its own protector. In order to protect the entire side of a frame, two upright protectors and one C profile are used. Two C profiles can also be fitted if the client requires.







### **Upright-frame protector**

Each type of upright has its own type of protector. They are 400 mm high and come with 4 anchor bolts to fix them to the floor. They are used to protect uprights from impact and possible damage in facilities where forklift trucks operate.

### **Corner protectors**

These protect the outer uprights when it is not possible to fit upright protectors. They are made from 400 mm high folded metal sheets. They have four holes in their base for bolting the component to the floor.

### **Upright reinforcer**

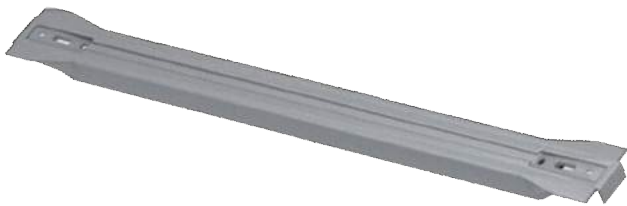
If the uprights of an installation need to be protected at a certain height, and it is not possible to fit an upright protector, an upright reinforcer is used which is fixed directly onto the upright instead of the floor. Upright reinforcers are made from wedgeshaped folded sheets and have holes along their sides so they can be fixed to the upright. Upright reinforcers are available in different heights for each type of upright.



Close-up of a galvanised pallet support

### **Pallet and container supports**

Depending on how the pallet or container is placed on the rack it may be necessary to add extra support to the beams, such the following pallet or container supports.



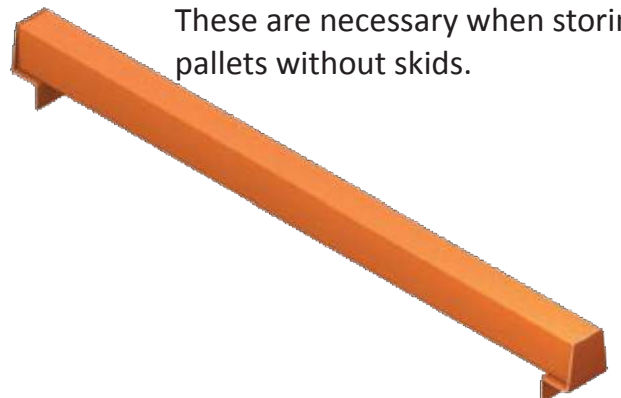
### **Galvanised pallet supports**

These are fitted perpendicular to the beams and are used to provide support to pallets when they are placed on the rack with the lower skids parallel to the beams or when the pallet quality is insufficient. Two are needed for each pallet.

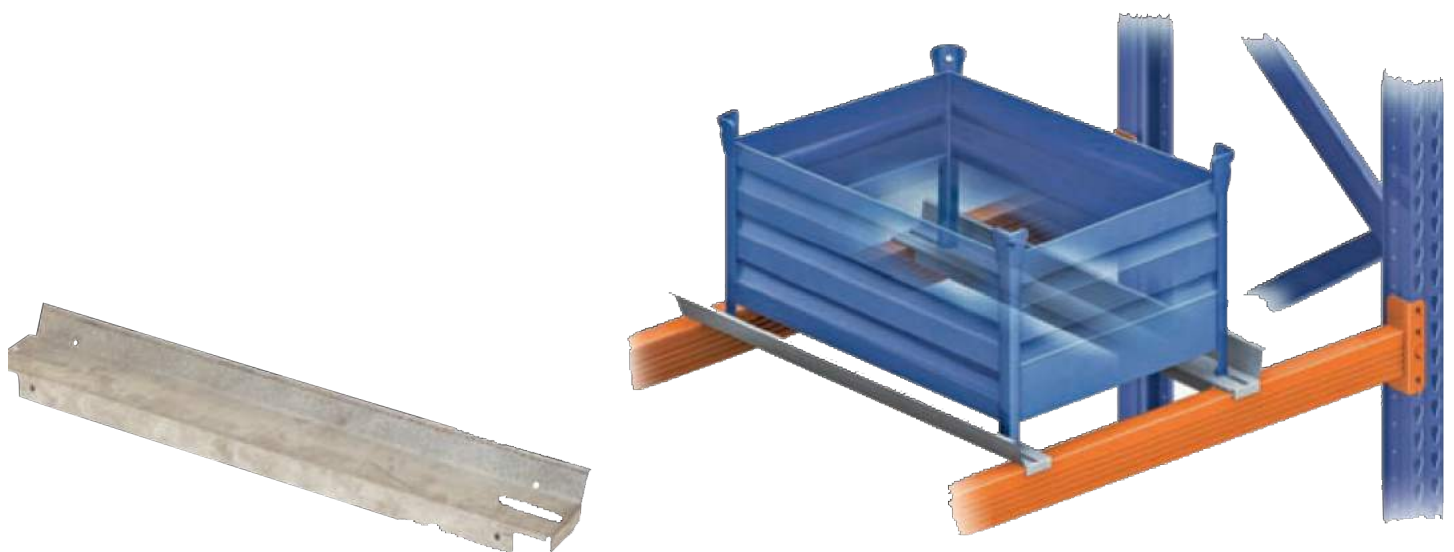


### **Raised pallet supports**

These are necessary when storing pallets without skids.

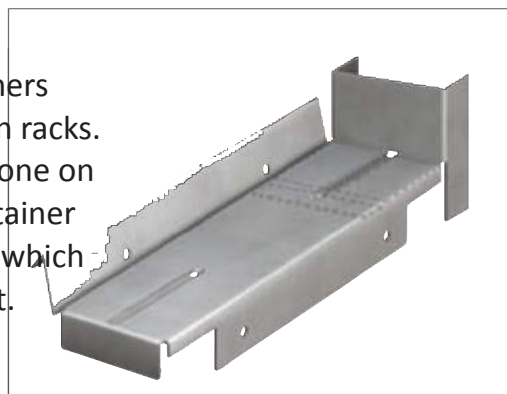




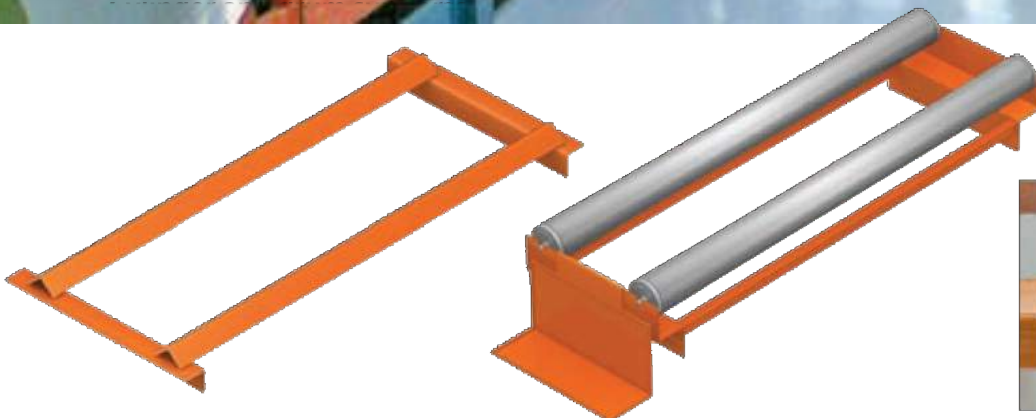


### Container support

This component is fitted when containers with legs instead of skids are stored on racks. Two supports are used per container, one on the right and one on the left. The container supports can be fitted with end-stops which are bolted to the back of each support.







### 2L Cylinder support

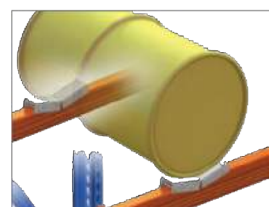
This set is made up of two L-shaped profiles joined by two front profiles which form a cradle, allowing the secure placement of the cylinder. They are fitted across the beams.

### Roller drum support

Made up of two rollers on which the drums turn, enabling liquid to be extracted from them. A tray below prevents the liquid from spilling onto the floor.

### Front drum support

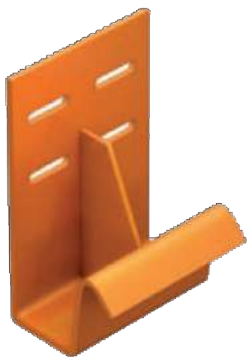
These are metal sections which are fitted to the 2C beams, allowing the storage of drums. A drum support is placed horizontally on the each beam. The V shape provides the necessary support to hold drums and reels in place.





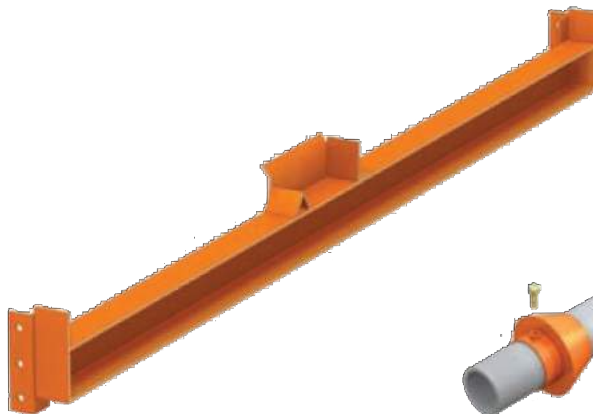
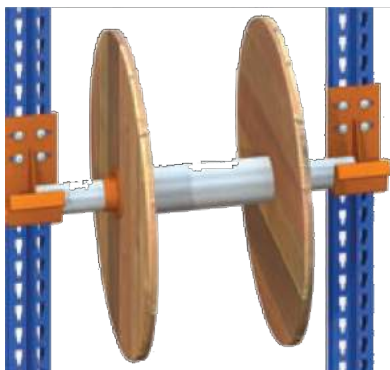
## Reel supports

Reel supports enable cylindershaped articles to be stored on a metal axle (cable reels and paper reels, etc.). Two systems are available; front storage and side storage, depending on the characteristics of the goods, their sizes and their use. Support axles and collars are available as accessories. They prevent the reels from slipping sideways.



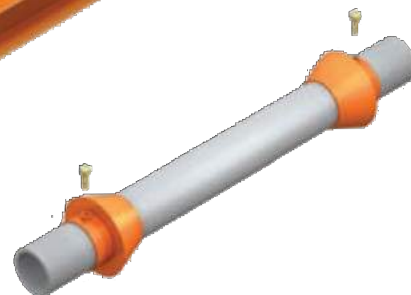
### Front reel support

The front reel support is fitted to the front uprights of the frame, where it is simply slotted into the upright slots.



### Side reel support

The side reel support is fitted laterally on to the frame using bolts and is used to position the reel on the centre of the frame.



### Support axle and collars

The axle is tubular with a diameter of 60 mm and is available in different thicknesses. It is used as an axle on which the reels can rotate, resting directly on the supports. Conical-shaped adjustable collars can be used as end-stops to prevent products from slipping along the axle.





### Safety features

Complementary elements to make installations safer, and prevent goods or pallets from falling.

The following elements are available:

1. Positioning profile
2. Safety profile
3. Fall protection mesh
4. Protective mesh in the passageways



### Positioning profile

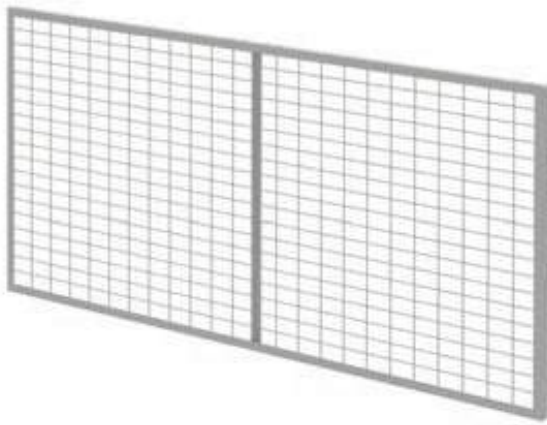
Located on the top of the rack in such a way that ensures the pallet (not the load) is in constant contact with said profile. This must resist stresses from pallet positioning, and therefore, the rack must be designed to withstand them.



### Safety profile

Works as a warning system, preventing a pallet from falling. In this case, it does not need to resist pallet movement stresses or serve as a brake system for intended manoeuvres. In this system, the load (not the pallet) is what butts up against the safety profile. This accessory serves as a safety mechanism to prevent potential falls or collisions of load units that might result from improper manoeuvring of the handling equipment.





### Fall protection mesh

When the load is not shrinkwrapped or it is possible that the safety profile might not be enough to prevent the goods from falling, fall protection mesh can be installed. This is an optional safety element which is fitted at the back of racks, where there is a danger of loads falling. They can cover all or part of the racking height. If a single rack borders on a work or traffic area, it must be protected with a net to prevent materials accidentally falling, becoming trapped, etc.



### Protective mesh in the passageways

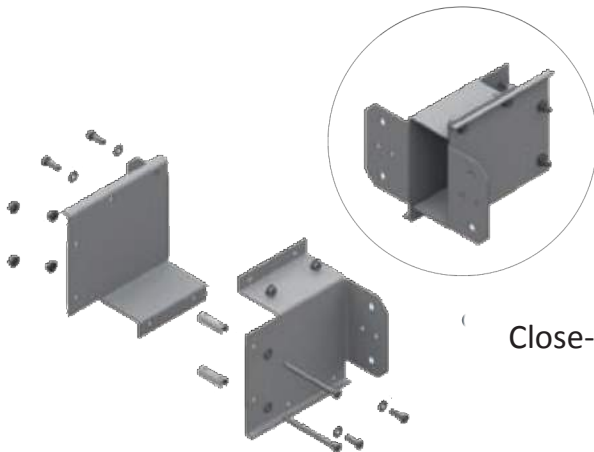
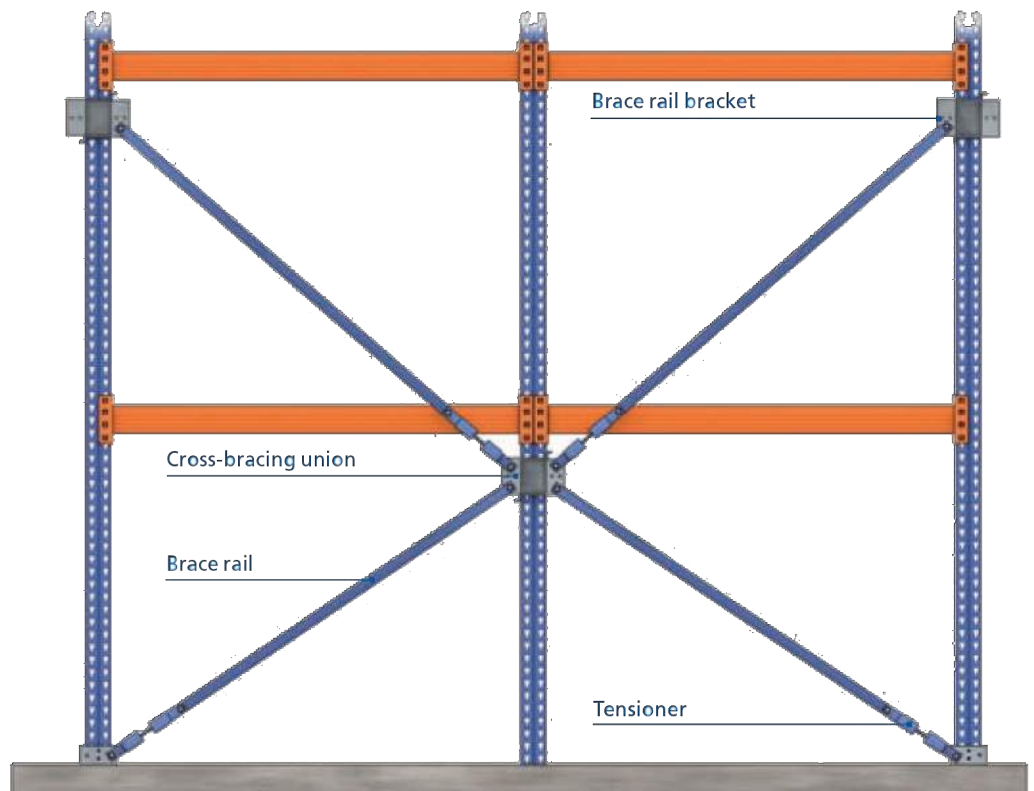
An alternative way of increasing warehouse safety and protecting people working in the passageways found in the lower levels of the racking (tunnels), is to fit them with protective mesh along the top. By doing so, warehouse operators moving around the passageways will not be hit by objects that become inadvertently dislodged from the upper levels of the racks.





### Cross Bracing

Cross braces are flat profiles fitted to supports which in turn are fixed to the frames. Each profile has a tensioner which gives it the necessary rigidity. They are used to increase down-aisle stability when the height and load make this necessary in the installation.



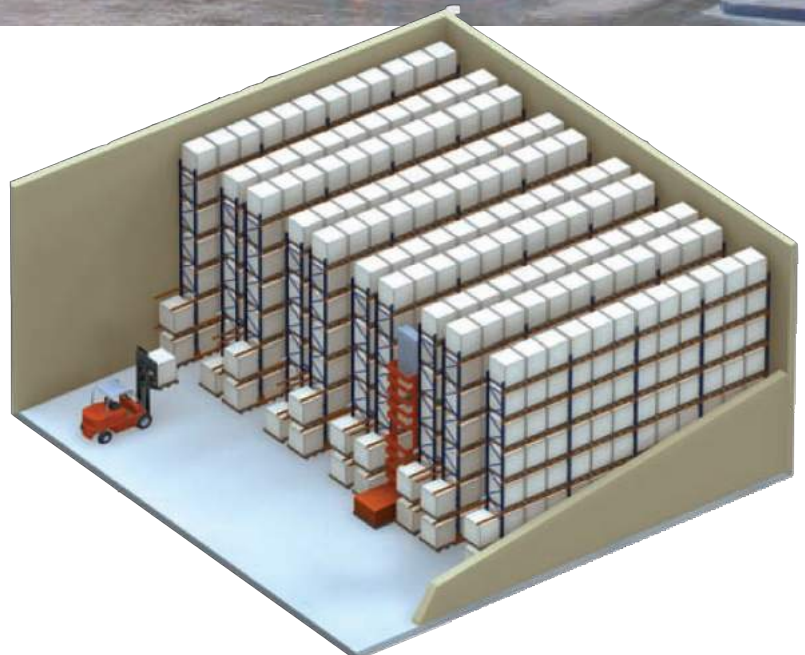
Close-up of the brace rail bracket





## GENERAL FEATURES OF HIGH-BAY PALLET RACKING SYSTEM

These warehouses are made up of high bay racks separated by narrow storage aisles. The main advantage of these warehouses is their excellent use of space and their direct access to any stored pallet.





## Turret trucks

Turret trucks are designed to work in narrow aisles, generally with high bay racking. These machines need to be guided when operating inside load lanes.

Outside the load aisles, the vehicles are slow and so most of their work is done within these aisles.

They are often supported by more conventional handling devices which help by depositing and picking up pallets at the end of the racking aisles. Turret trucks can be classified into two different systems:



### **Man-up system (Class 300 A)**

The driver of the truck sits inside the cabin which moves up and down with the goods. This enables greater manoeuvrability and allows the operator to pick directly from the pallets.

This system is also known as combi, as both pallet storage and picking work can be combined.



### **Man-down system (Class 300B)**

This system is characterised by the use of a truck in which the driver's cabin remains immobile while the goods are moved up and down.

## Types of forks

Goods can be extracted with two types of forks: trilateral and bilateral.



### Trilateral forks

Trilateral forks enable pallets to be picked up from and deposited on the floor in three positions: from the front, and from either side of the truck via a rotating swivel carriage head.



### Bilateral fork

Bilateral forks can only pick up and leave pallets in a raised position and so cannot pick them up directly from the floor. Installations will be taller and aisles narrower.

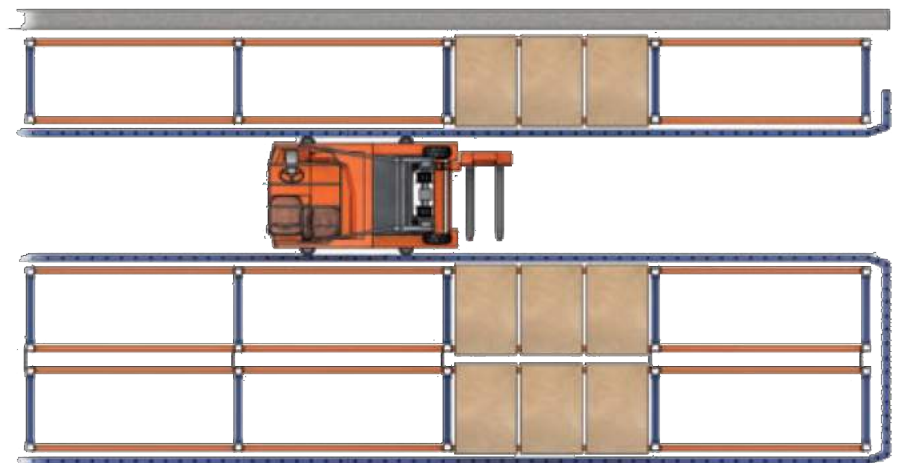




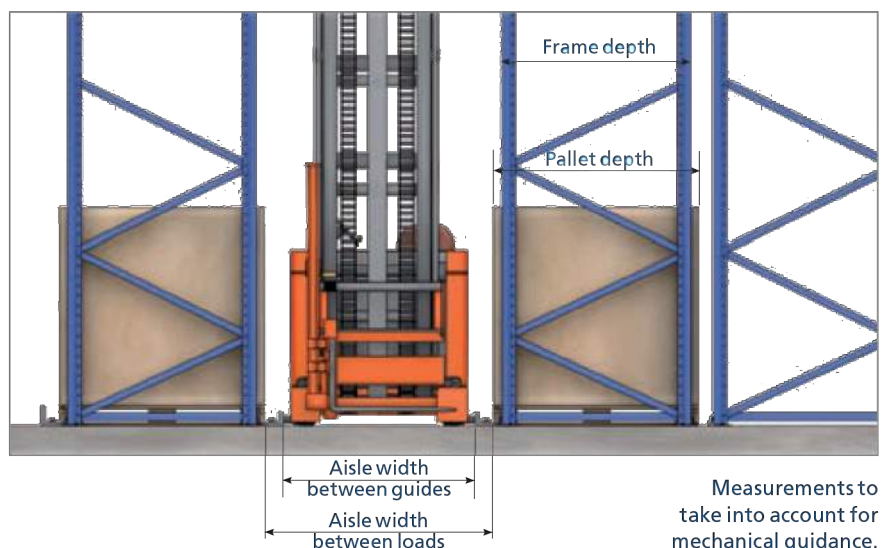
### Guidance systems for turret trucks

Turret trucks must be guided along the inside of storage aisles. These vehicles can be wire-guided, in which case a wire is embedded into the floor, giving off a magnetic field to guide the truck's movement, or mechanically guided, using profiles which are fitted to both sides of the aisle, and anchored to the floor.

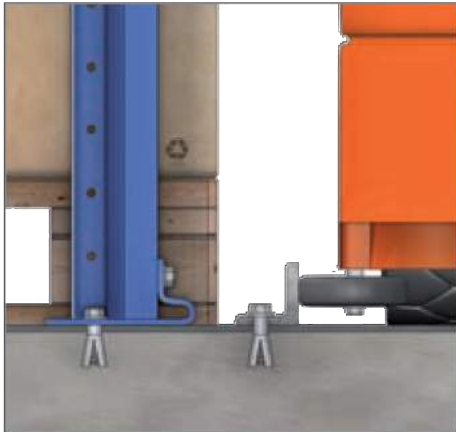
Each vehicle model functions with a different type of guide rail and aisle width. The distance between guide rails and the distance between load pallets must be defined in the aisle width.



Mechanical guidance. General layout.

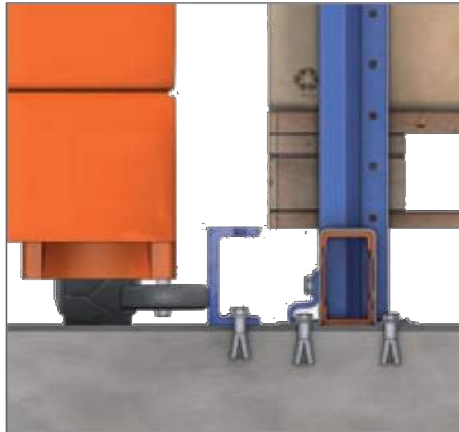


Measurements to take into account for mechanical guidance.



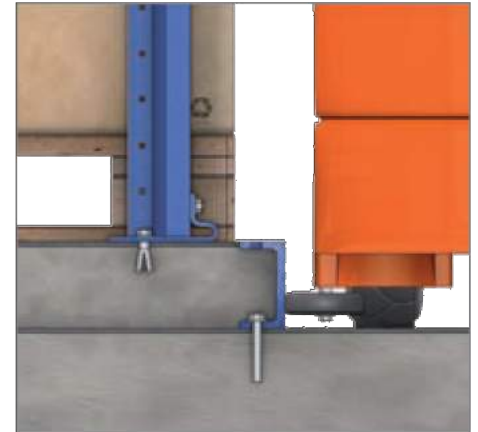
#### Guidance with LPN 50 profile

The pallets are supported directly on the floor.



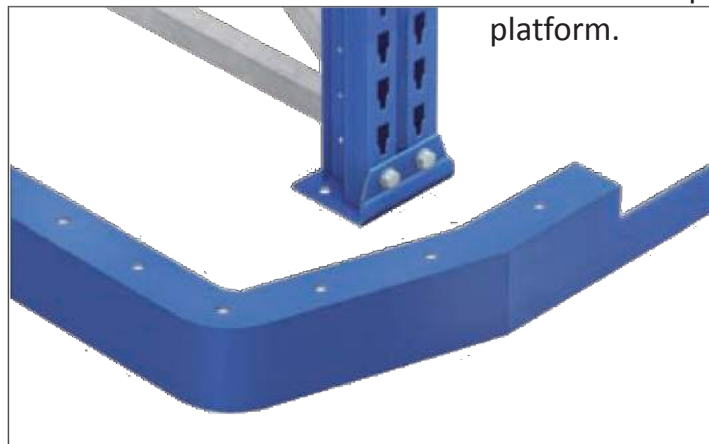
#### Guidance with UPN 100 profile

The pallets are supported on profiles fitted onto the floor or on the beams.



#### Guidance with UPN 100 profile forming concrete platform

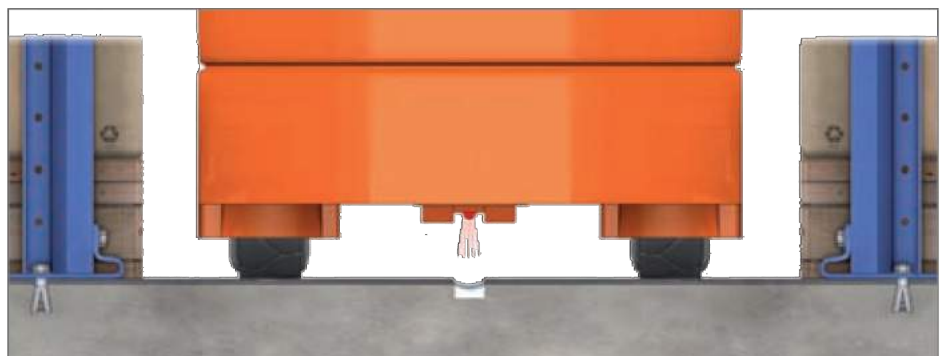
The space between the guide rails under the racks is filled in with concrete. The racks are built on top of concrete platform.



In the aisle entry with mechanical guidance entry profiles are fitted with guidance entry rails in order to help control the vehicles.

#### Wire guidance

A wire embedded into the floor produces a magnetic field which guides the vehicle.



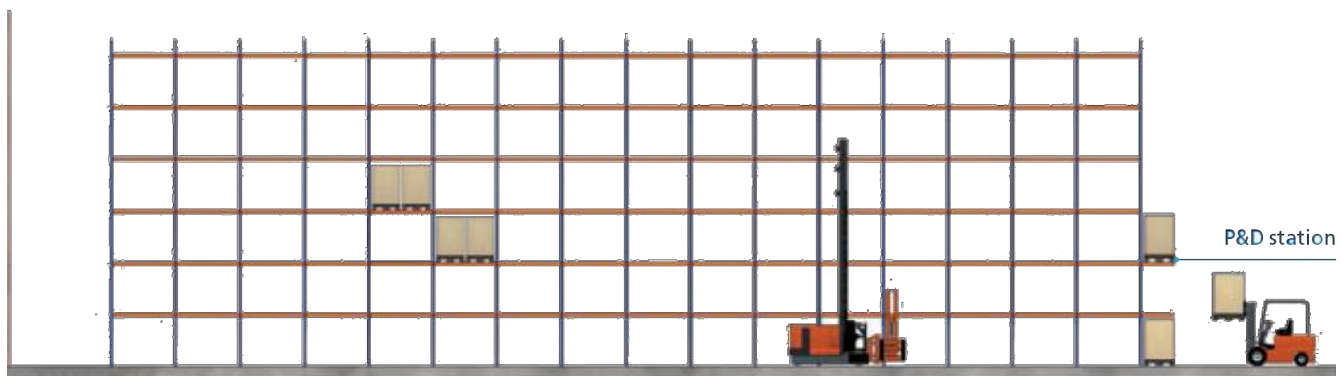
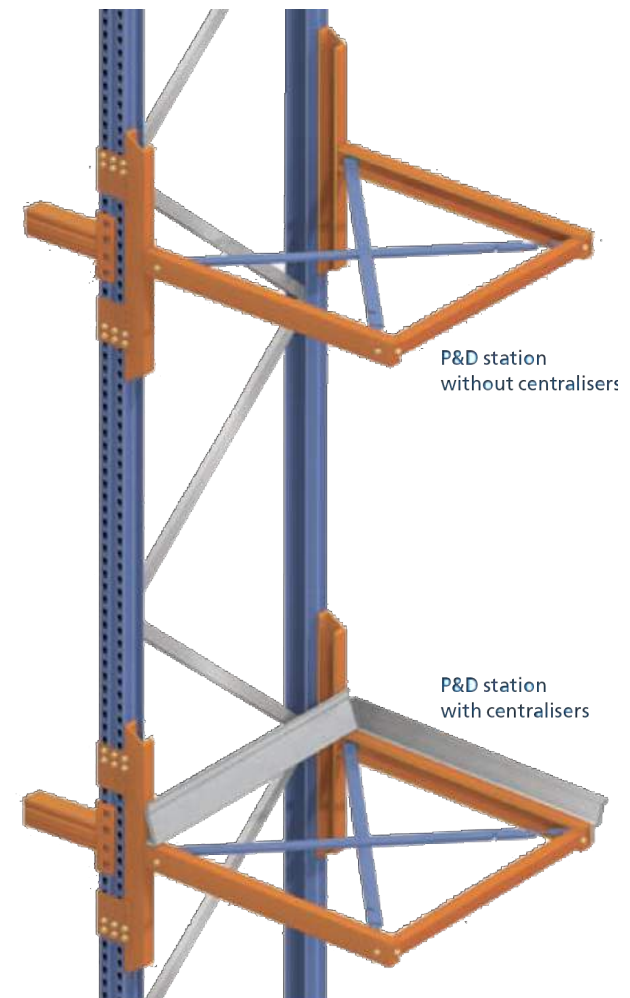


## Pick-up & Delivery stations

P&D stations are installed at the rack ends in order to deposit the pallets temporarily. These are commonly used in narrow aisle systems.

Turret trucks, designed fundamentally to work inside the aisles, pick up and deposit the pallets on the P&D stations. Other more conventional fork-lift trucks then handle the pallets from this point. A number of different P&D stations are available. They have been designed to cover different need, depending on quantity in height, sizes, loads, etc. P&D stations can also be fitted with pallet centralisers which enable pallets to be positioned with greater precision, making it easier to place them in locations with lower tolerance margins.

When the guidance is done mechanically, pallet support rails must also be fitted at the rack ends.







### **P&D conveyor systems**

In high-bay warehouses of this type, transporting pallets from the docking area to the rack's P&D station can be automated. To do this, the warehouse is equipped with roller and chain conveyors. In some installations, shuttles are also used. These move the pallets to and from the rack's entry and exit points.



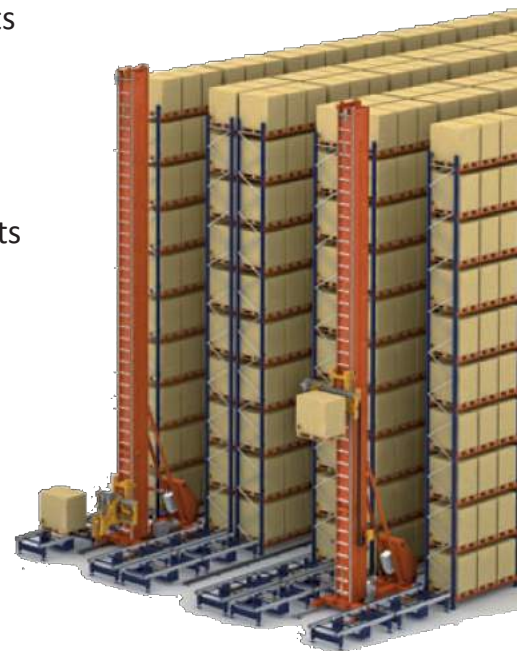
### **Automatic trilateral stacker crane**

This is the perfect solution for the simple automation of a warehouse with conventional racks of up to 15m high.



The stacker crane moves the pallets to the end of the aisle leaving the load on a rack or automated transport system. This is possible since it has a rotating head which allows it to pick-up and leave pallets in three positions: in front and at either side.

Operation is fully automated, and all stacker crane movements are in response to storage or retrieval commands sent from the control system, which optimises its movements.





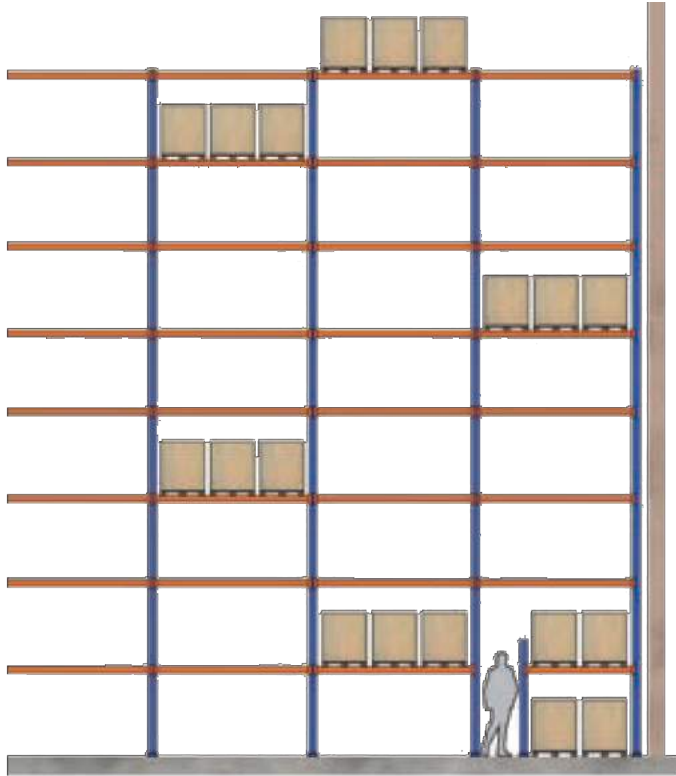
## SAFETY ACCESSORIES

### Safety passageways

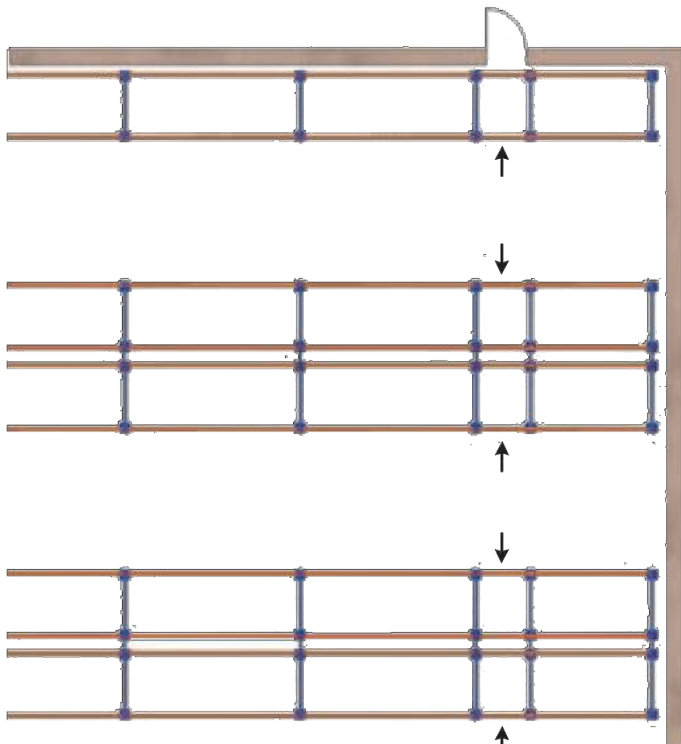
For safety reasons an installation may require ground-level passageways running through the racks as emergency exits.

### Top portal tie

High bay racks are often connected at the top by portal ties to provide additional stability.



Side view of an installation with walkway.



Top view of an installation with walkway.





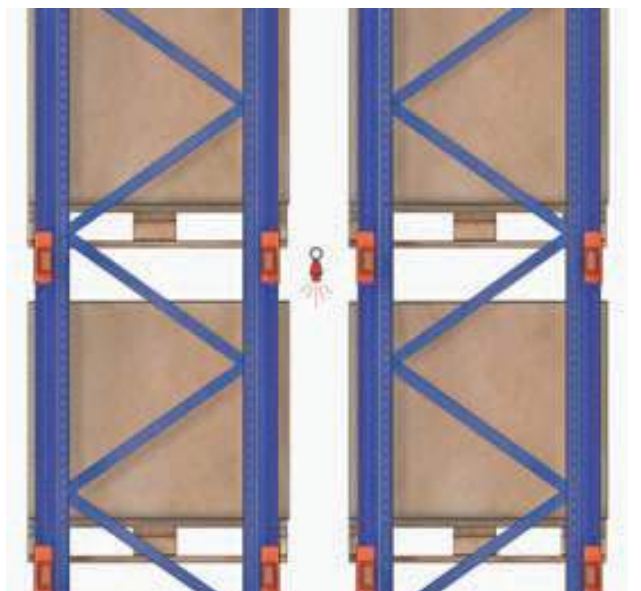


### Fire-protection systems

High-bay racks are usually equipped with a built-in fire protection system.

If such a system is installed, it is necessary to determine the tolerances between racks and the separation between levels necessary for the pipes and sprinklers to be installed.

The pipes and sprinklers should coincide with the position at which the beams are fitted.









STORAGE TECHNOLOGIES & MATERIAL HANDLING

Thank you for your attention!  
We welcome your questions, you can find us at:

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