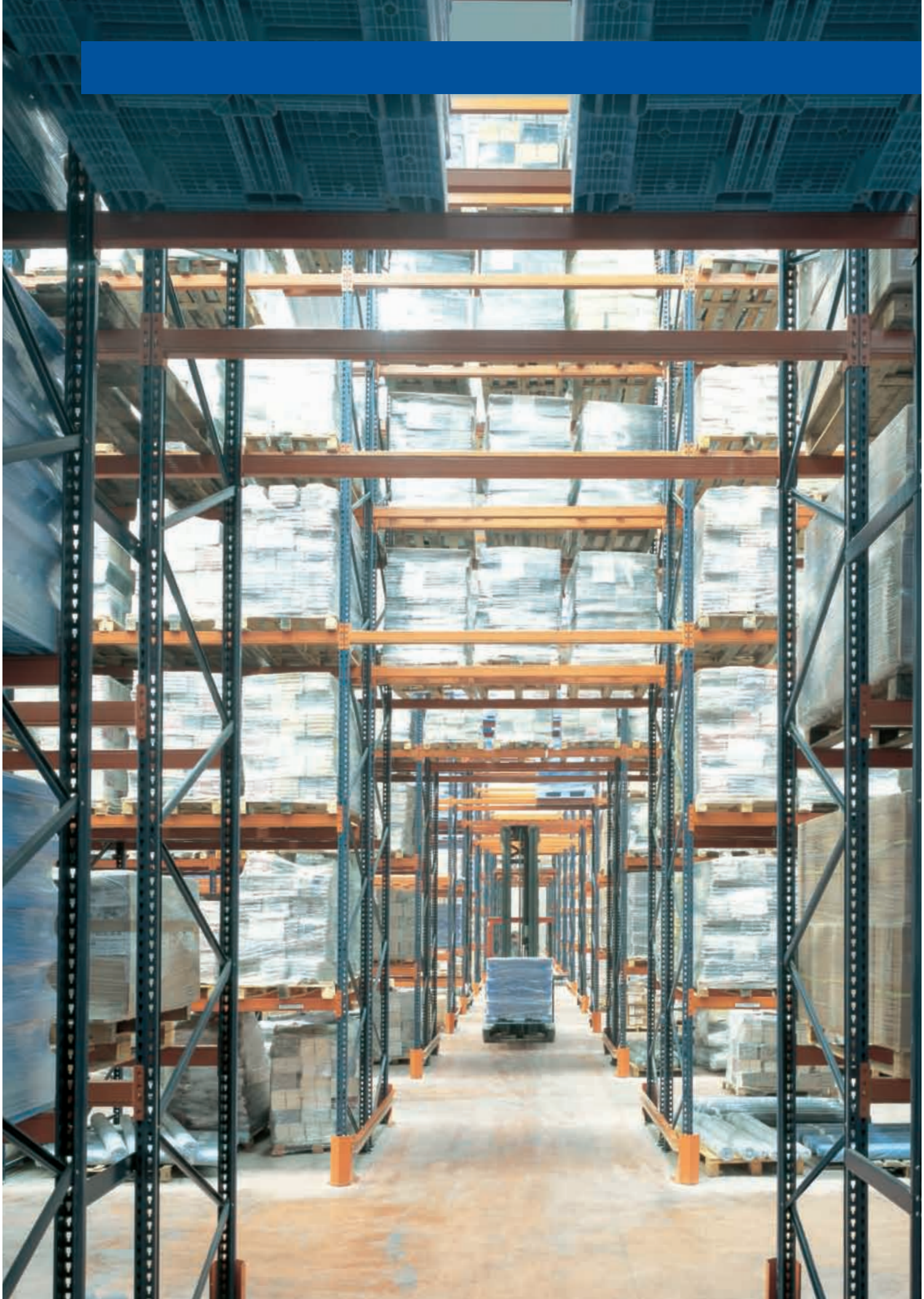


Mecalux conventional pallet racking system represents the best response for those warehouses in which it is necessary to store palletised products with a wide range of load types.

The most significant advantages of conventional pallet racking are:

1) Goods can be easily removed as each pallet can be accessed without the need to shift other pallets.
2) Total stock control: each storage space is taken up by a single pallet.
3) Maximum adaptability to any load type both in terms of weight and volume.

A conventional pallet racking warehouse is generally laid out with single-entry wall racks on the perimeter sides and double-entry racks in the middle. The working aisle measurement between each rack and the rack height depends upon the characteristics of the forklift trucks or lifting devices, pallet size and the height of the warehouse itself.

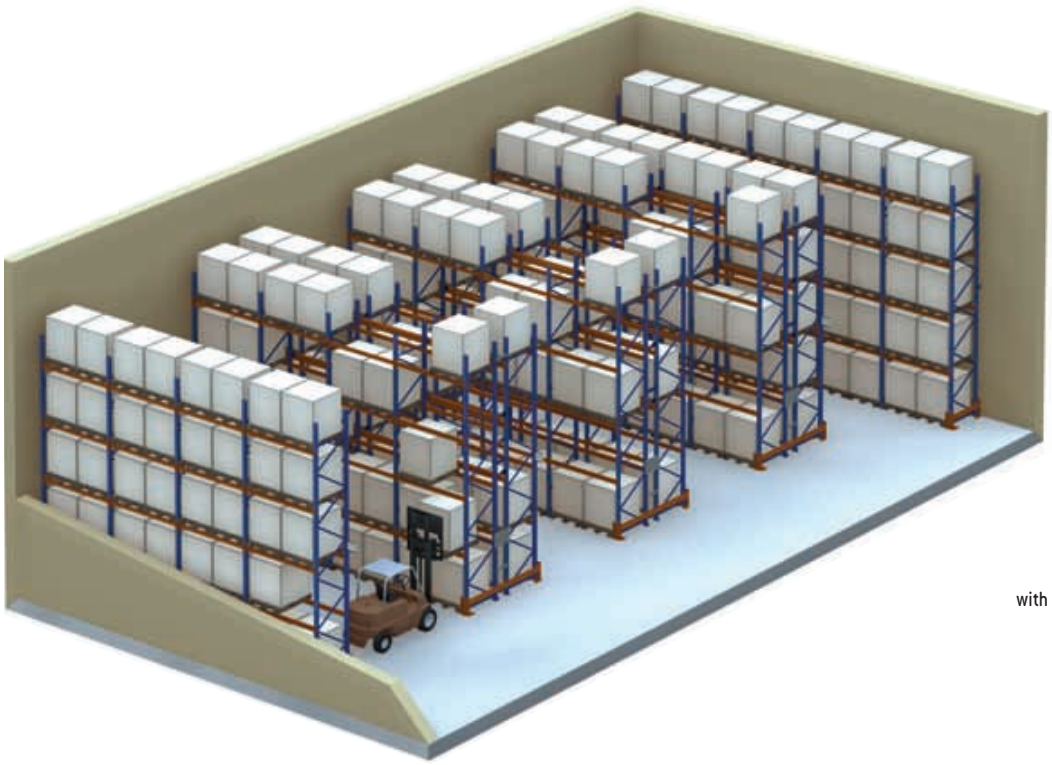
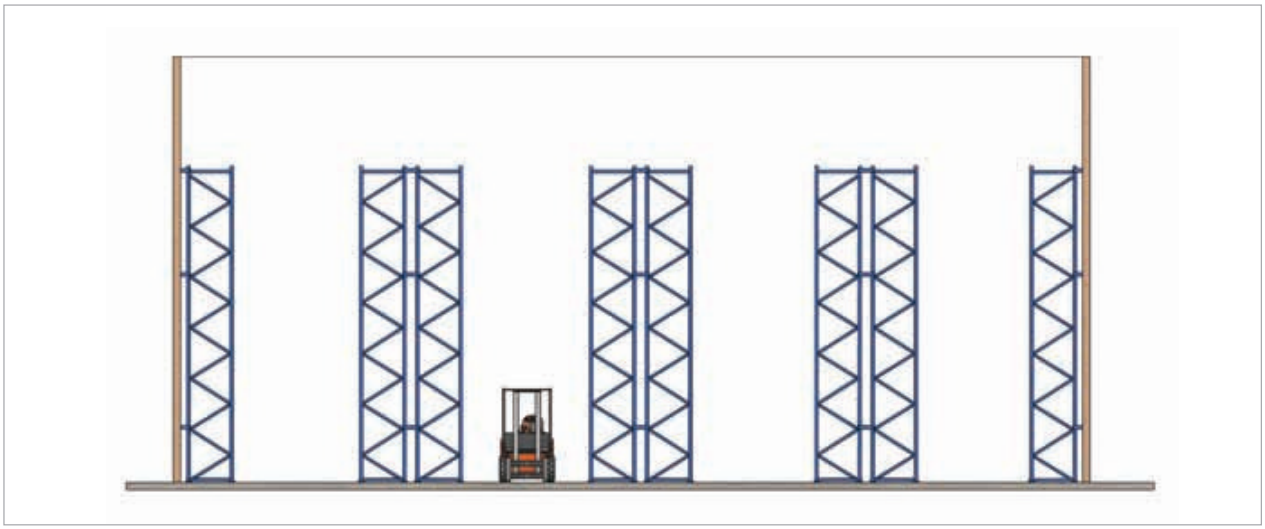


Illustration of a warehouse with conventional pallet racking.

Double-Deep Conventional Pallet Racking

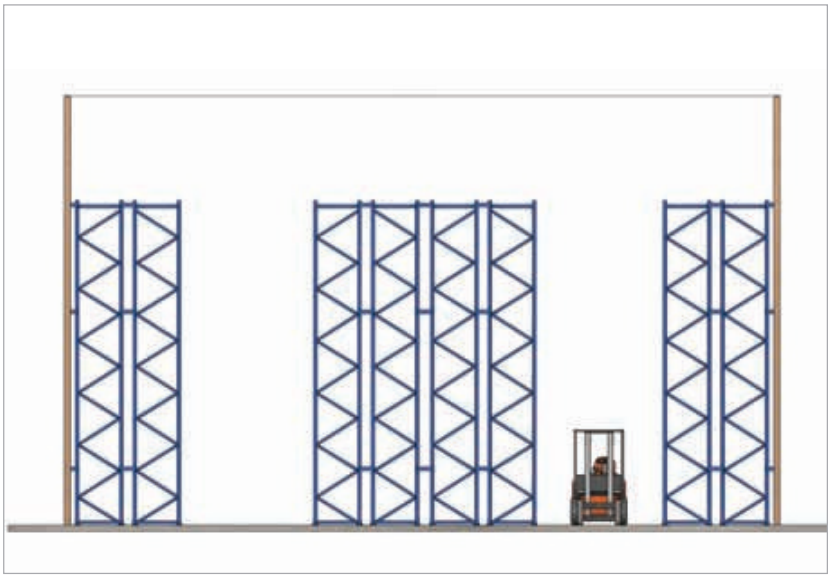


The most common conventional system made up of a single-entry rack fitted to the wall and double-entry racks in the middle.

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

Direct access can only be made to the front pallets and so it is only recommended to store products with several pallets per load type so as to avoid an increase in manoeuvre times due to double movements.

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



Double-deep conventional system.


A-O
A-N

Aisle

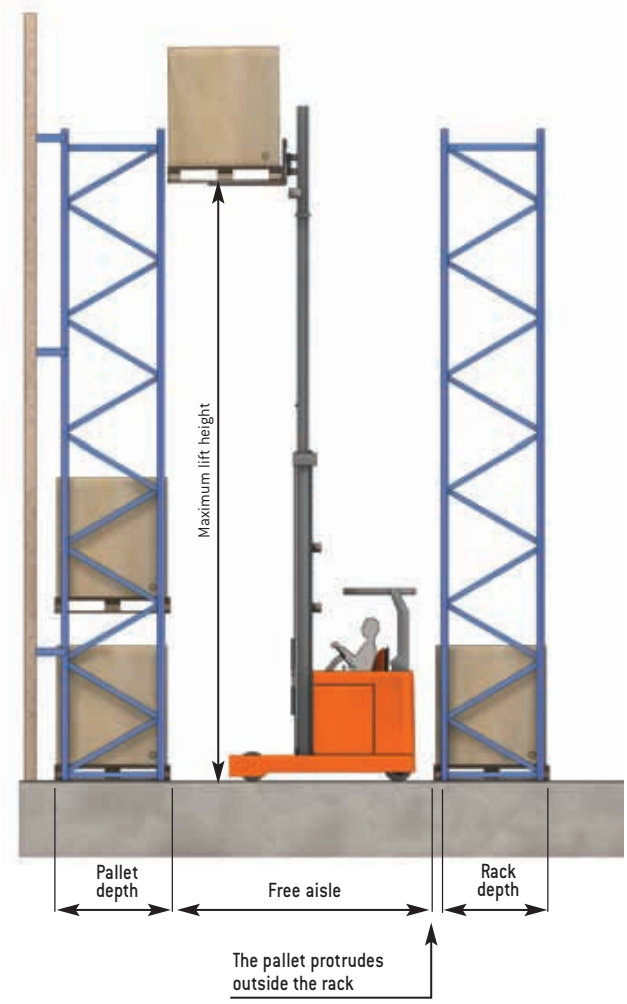
In order to define the minimum free aisle width between loads it is necessary to ascertain the type and model of forklift truck. This information can be found in the technical specifications of each forklift truck. As a guideline for pallets measuring 1,200 x 800 mm, picked up on their sides measuring 800 mm, the following type of lift trucks are used:

Stacker:	**from 2,200 to 2,300 mm**
Counter-balanced forklift:	**from 3,200 to 3,500 mm**
Standard reach truck:	**from 2,600 to 2,900 mm**
VNA Man-down turret truck:	**from 1,400 to 1,600 mm**
VNA Man-up turret truck:	**from 1,700 to 1,900 mm**
Stacker crane:	**from 1,400 to 1,600 mm**

Reach height and tolerance

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 tolerance. This should never be less than the figure indicated in the technical rack tolerances table on page 28. Reach heights also differ for each type of forklift truck. This information can be found in the technical specifications of each fork-lift.

Stacker:	**maximum 5,200 mm**
Counter-balanced forklift:	**maximum 7,000 mm**
Standard reach truck:	**maximum 11,000 mm**
VNA Man-down turret truck:	**maximum 12,500 mm**
VNA Man-up turret truck:	**maximum 12,500 mm**
Stacker crane:	**maximum 40,000 mm**



The Most Commonly Used Forklift Trucks

Stacker

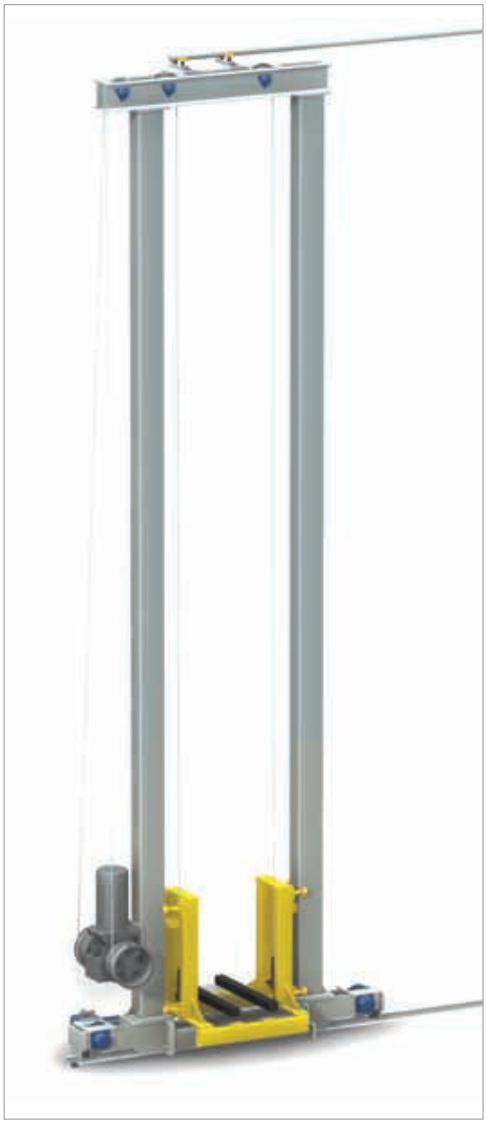
Counter-balanced forklift

Standard reach truck

VNA Man-up turret truck

VNA Man-down turret truck

Stacker crane



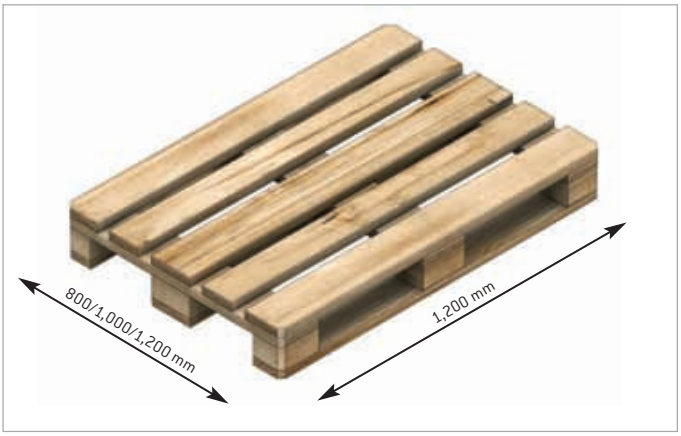
Pallets and Containers

Pallets and containers are elements upon which the goods to be stored are placed. Their different characteristics determine the way they should be stored. The most common types are:

Europallets

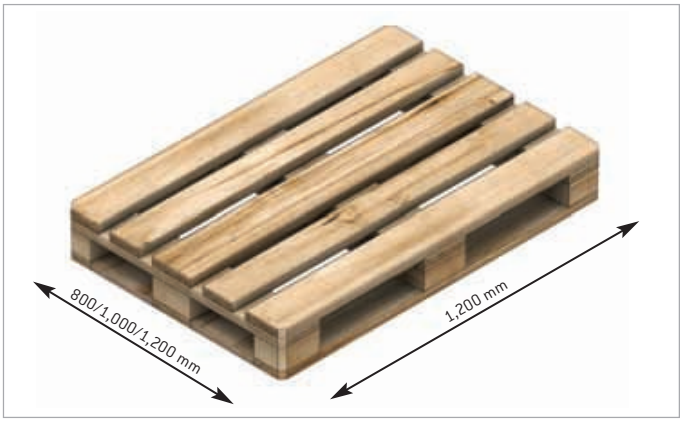
Europallets generally measure 800 x 1,200 mm and are handled by their narrowest side. They are also manufactured in 1,000 x 1,200 and 1,200 x 1,200 mm sizes following the same pattern.

They are built with nine blocks and three stringers along the pallet base.



Perimeter base pallets

These pallets are built in a similar way to Europallets, but they have two additional stringers at the pallet base connected together to the other three main stringers.



Stillage containers

Stillage containers are generally metal and are built with variable specifications and sizes. They may require additional components to be used for storage on conventional pallet racking.

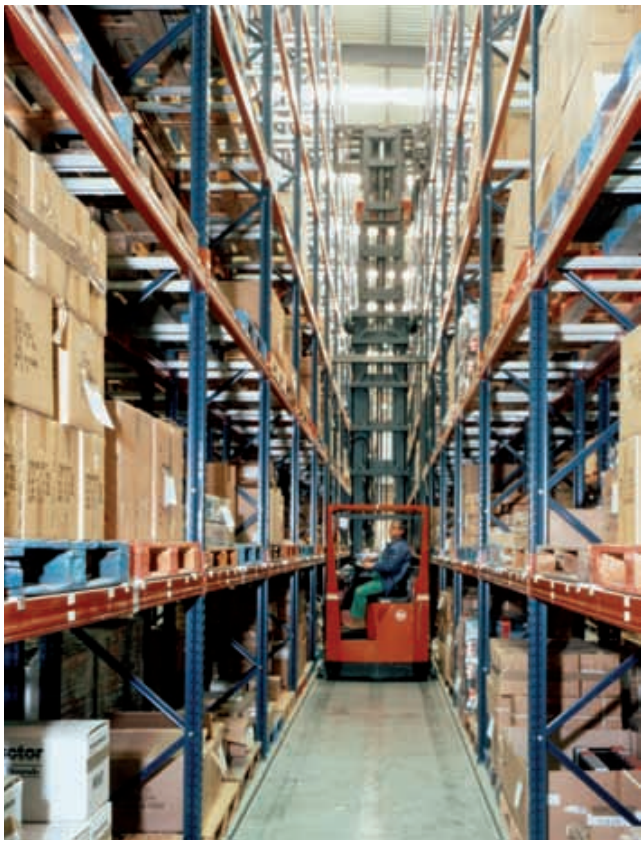
Other pallets and containers

In addition to the above 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.

Conventional pallet racking warehouse. Pallet handled by side measuring 800 mm.

Pallets are normally handled by the narrowest side. For example, Europallets (800 x 1,200 mm) have three stringers running along their 1,200 side. These should rest perpendicularly on the support beams.

On occasions, particularly in order to facilitate picking work, they are handled on 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).

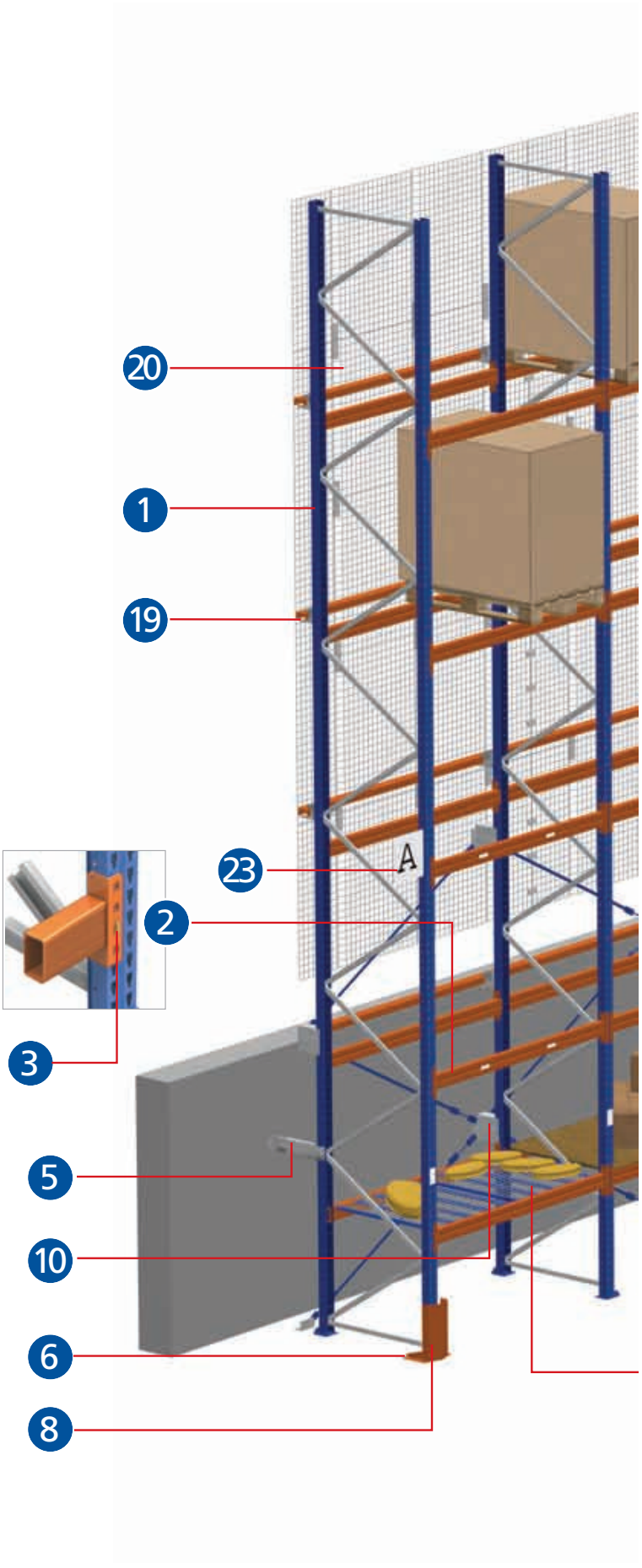


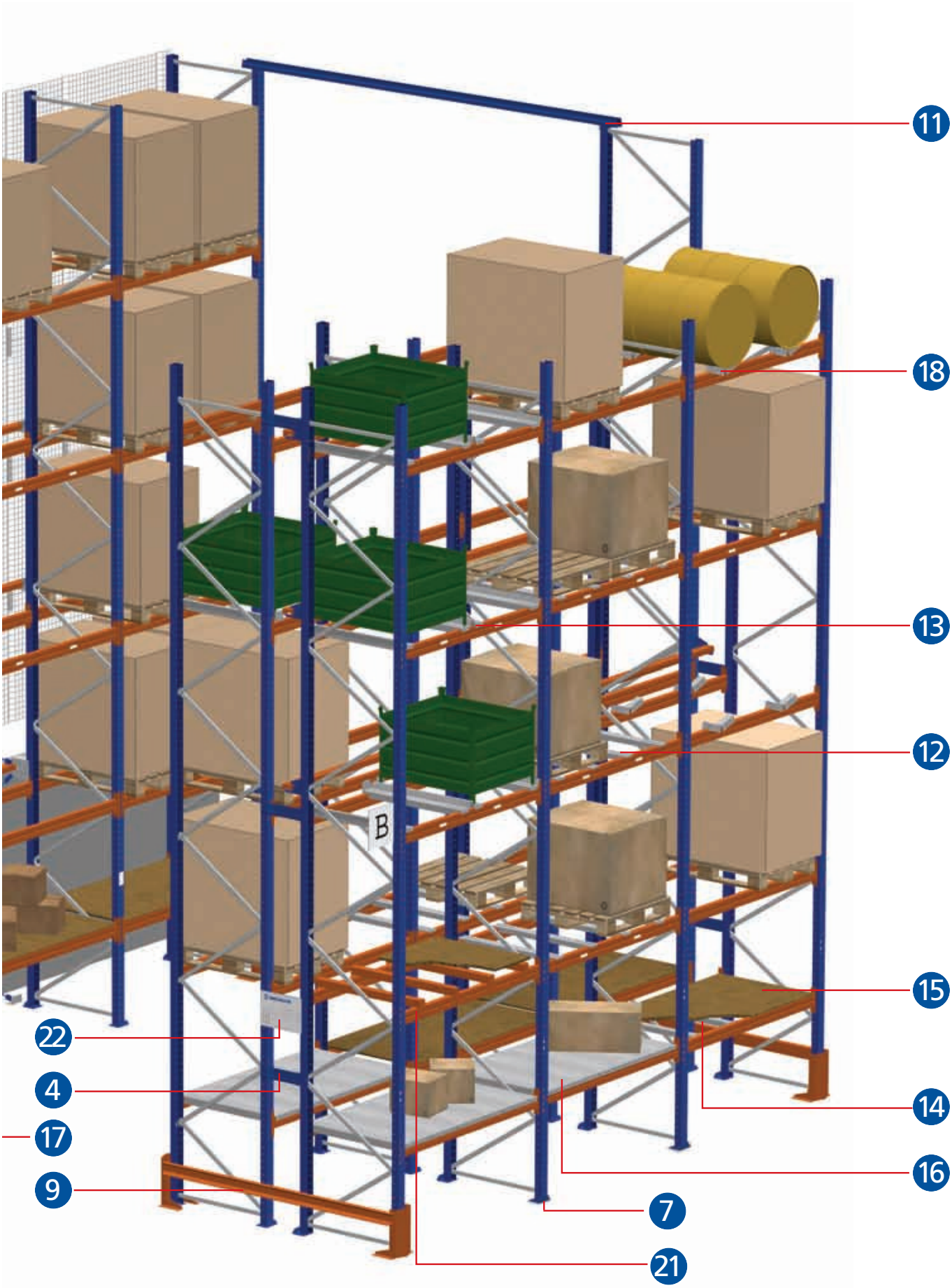
Pallet racking system with 7 load levels.
Pallet handled by side measuring 1,200 mm.

Components

In order to store palletised products, Mecalux, with its wide experience as a racking manufacturer, has developed an extensive range of accessories which enable the most demanding of storage needs to be met.

Basic components of conventional pallet racking




11
18
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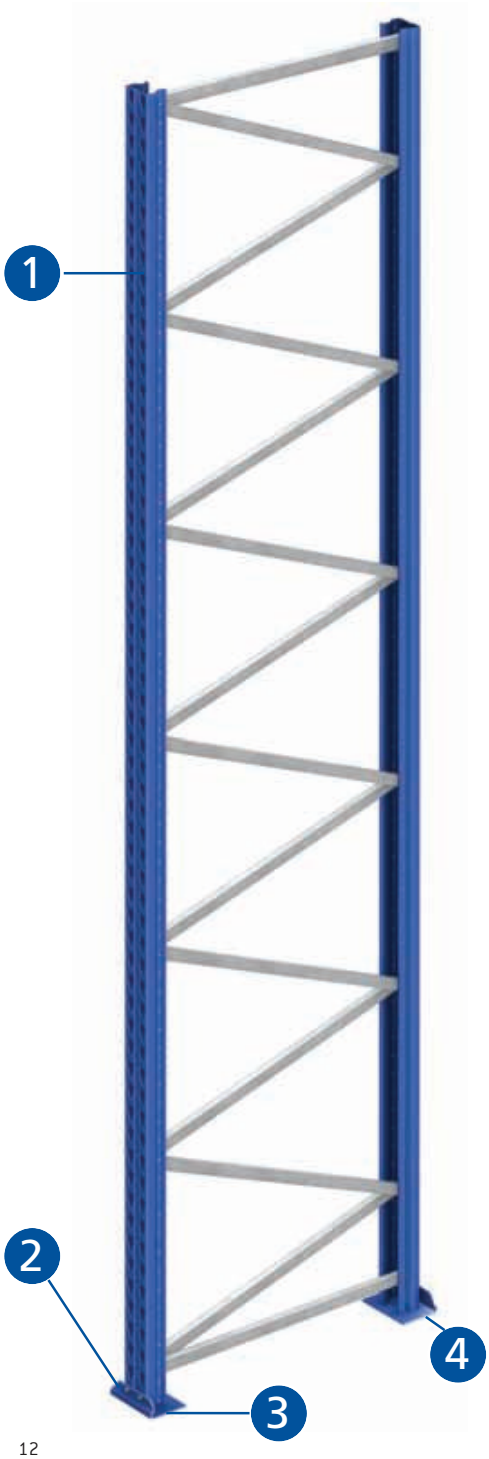
9
B

Frames

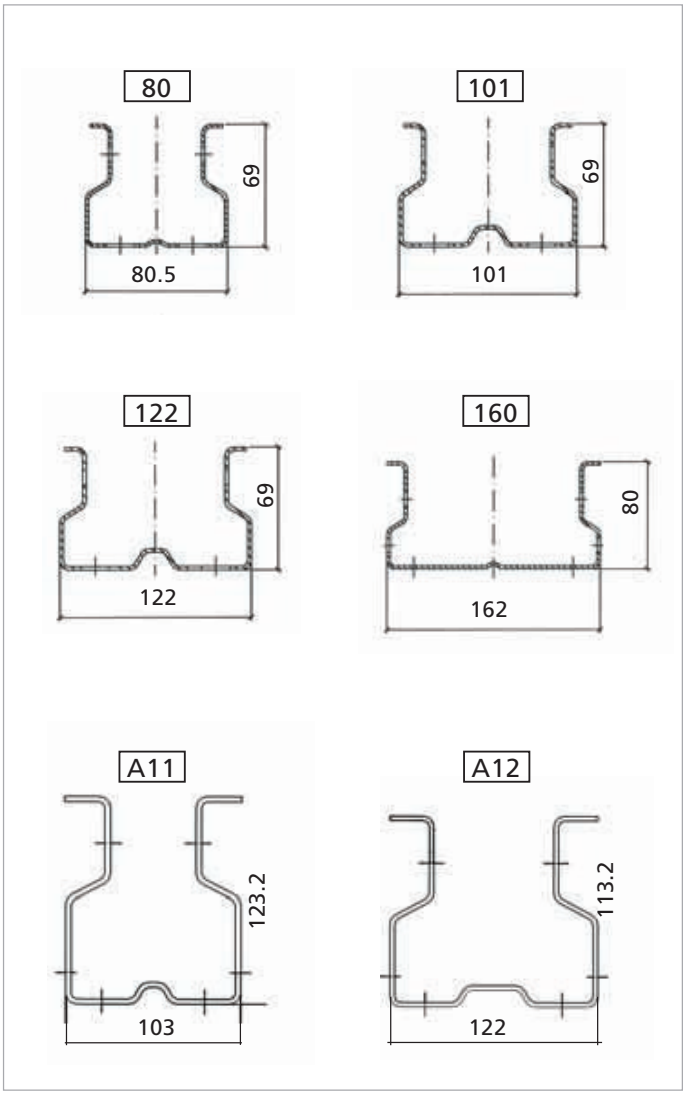
Frames are made up of two uprights with the corresponding horizontal and diagonal bracings, footplates and accessories. They are slotted every 50 mm in order to fit the beams.

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

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



(in mm)

Frame footplates

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

2

Levelling shims

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

3

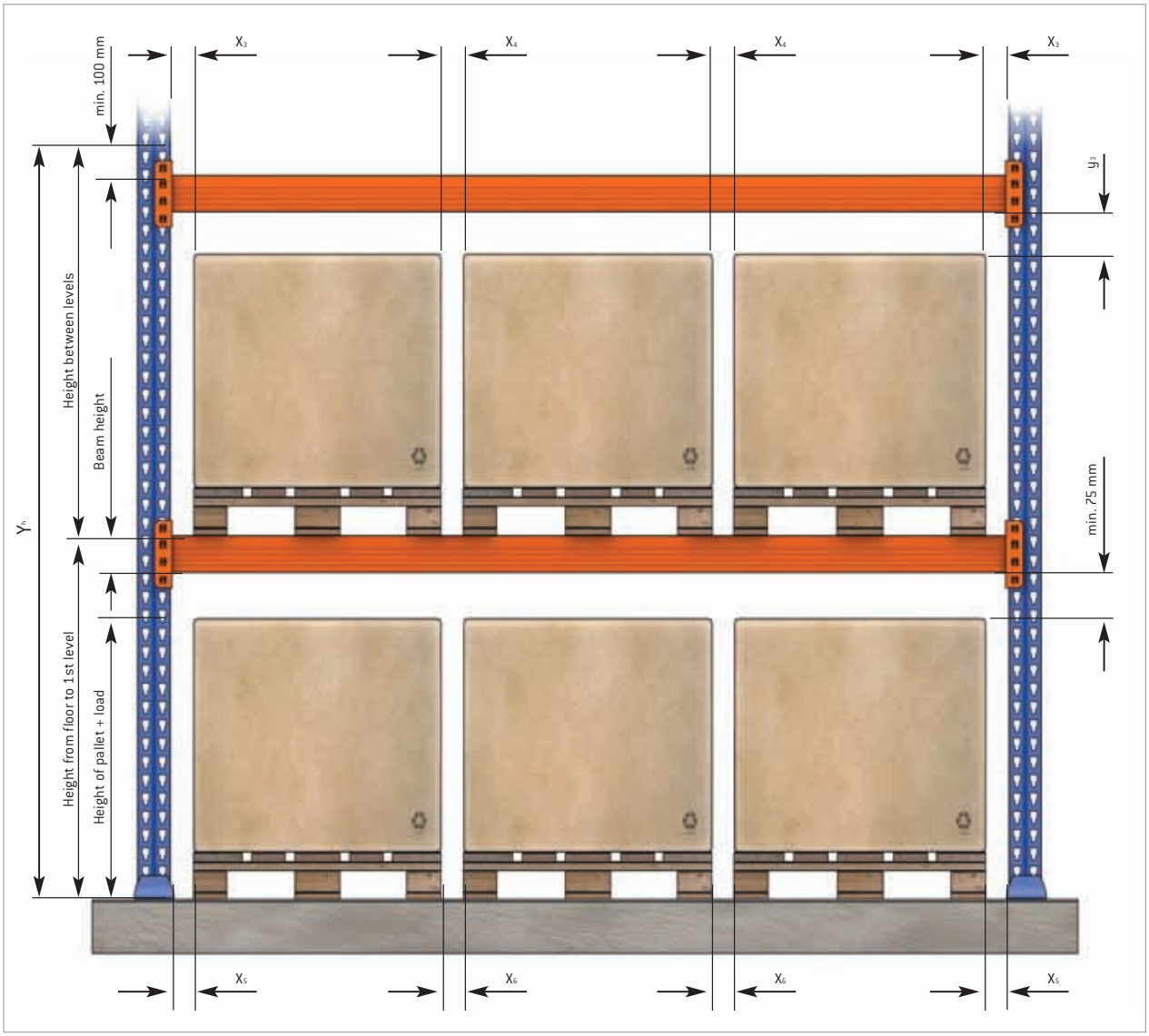
FLOOTPLATE AND SHIM MEASUREMENTS			
UPRIGHT	WIDTH	DEPTH	cm²
80	135	110	148.5
101	155	110	170.5
122	175	110	192.5
160	215	110	236.5
A11	determined by the load		
A12	determined by the load		

Anchor bolts

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

4

Tolerances



The height between levels is obtained by adding the height of the pallet including the load, to the tolerance Y3, plus the height of the beam and then rounding up this figure to the next multiple of 50 mm.

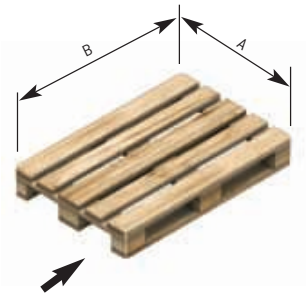
LEVEL HEGHT	CLASS 400		CLASS 300A		CLASS 300B	
	X_3 X_4	Y_3	X_3 X_4	Y_3	X_3 X_4	Y_3
Y_h (mm)	X_5 X_6		X_5 X_6		X_5 X_6	
3,000	75	75	-	-	-	-
6,000	75	100	75	100	100	100
9,000	75	125	75	125	100	125
12,000	-	-	75	150	125	125

Class 400: racking for front loading forklift trucks (stackers, counter-balanced and reach trucks).

Class 300A: racking for VNA man-up turret trucks.

Class 300B*: racking for VNA man-down turret trucks.

BEAM MEASUREMENTS (except class 300B) **in mm**

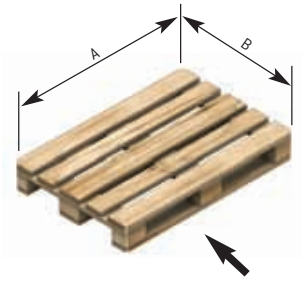


Pallet		L (Beam)
A	B	
800	1,200	1,825
1,000	1,200	2,225
1,200	1,200	2,625

Pallet		L (Beam)
A	B	
800	1,200	2,700
1,000	1,200	3,300
1,200	1,200	3,900

Pallet		L (Beam)
A	B	
8001,200	3,600	

BEAM MEASUREMENTS (except class 300B) **in mm**



Pallet		L (Beam)
A	B	
1,200	800	2,625
1,200	1,000	2,625
1,200	1,200	2,625

Pallet		L (Beam)
A	B	
1,200	800	3,900
1,200	1,200	3,900
1,200	1,200	3,900

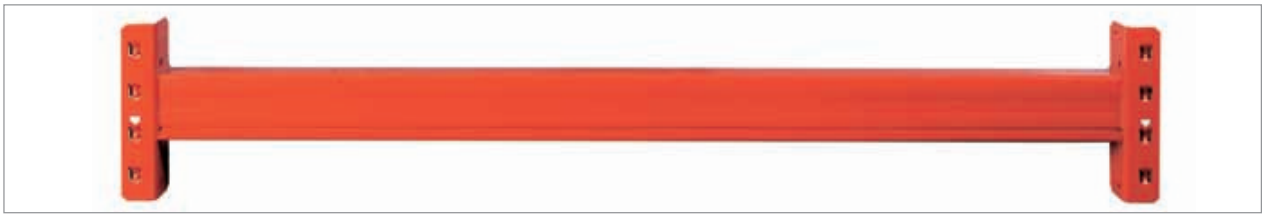
FRAME DEPTH MEASUREMENTS

Pallet entry by the narrow side	Pallet measurements	Pallet entry by the wide side
B = 1,100	800 x 1,200	B = 800
B = 1,100	1,000 x 1,200	B = 1,000
B = 1,100	1,200 x 1,200	B = 1,200

Beams

Beams are the horizontal and robust components of the racks upon which loads are deposited. They are joined to the uprights using connectors which are fitted into the frame slots via connector hooks. Our unique connector hook system, – a connexion system developed and patented by Mecalux –, is joined to the main connector beam body at both ends. This considerably increases load capacity and prevents deformations caused by the upper and lower parts not being aligned with the body of the connector. Additionally our connector system reduces the possibility of the beam falling, which could occur if it began to prise open due to fatigue or accidental dislodgement. Two safety pins are located into each beam to give additional protection against the beam dislodging whilst in use.

Mecalux manufactures a wide range of beams covering different needs in terms of their size, type and their load capacity. The measurements of the load levels are determined by the number and size of the pallets stored, following the indications in the rack tolerances table on page 28.

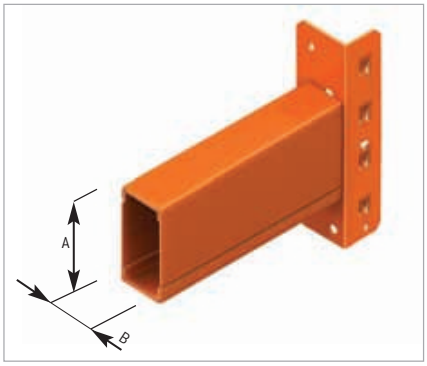


Beam type

There are six standard models classified into two families distinguished by the size of the end connectors.

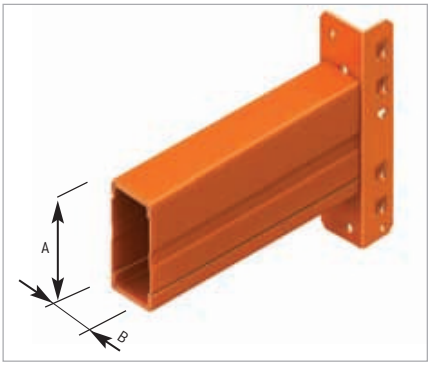
MODEL L2C	A (height in mm)	B (width in mm)
815	80	50
1.015	100	50
1.115	110	50
1.315	130	50
1.515	150	50
1.618	160	50

2C Beam (815, 1015, 1115)



Made up of two C-shaped profiles fitted into each other and welded to two end connectors.

2C Beam (1315, 1515 and 1618)

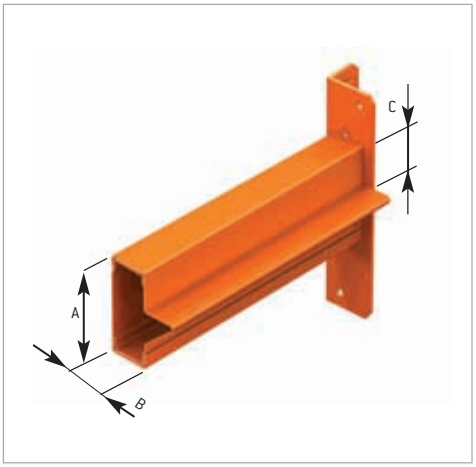


These beams are used for heavy loads and longer lengths due to their strength.

Mixed beams for pallets and picking

J Beam

These beams are made up of two profiles, one C-shaped and the other J-shaped fitted into each other and welded to two connectors. They can be used for mixed storage with pallets and picking on the same levels.



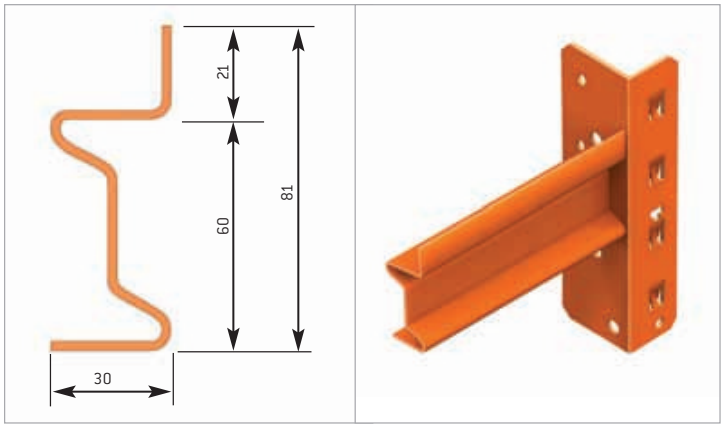
J MODEL	A (height in mm)	B (width in mm)	C
J-815	80	50	25
J-1115/25	110	50	25
J-1115/42	110	50	42

Picking beams

These beams enable shelves to be fitted in order to place loose goods or perform picking work.

ZS-60P Beam

Made up of a Z-profile welded to a four-hooked connector at each end. This profile is folded with an edge along the top and is designed to fit shelves inside. It is used to create picking levels in pallet racking installations.

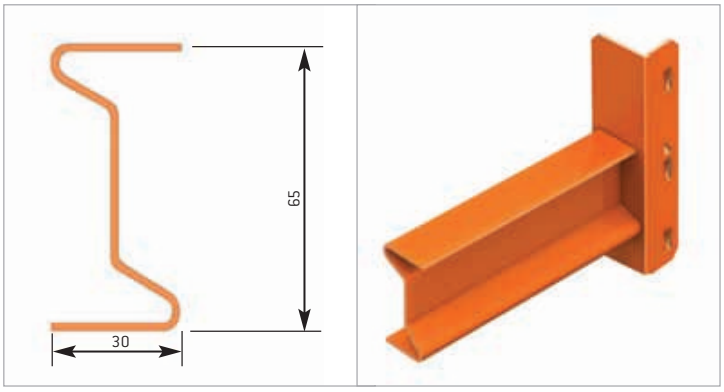


(in mm)

MS Beam

Z-shaped profiled beam welded to a connector at each end.

It is used as a mid-position support for deep shelves.



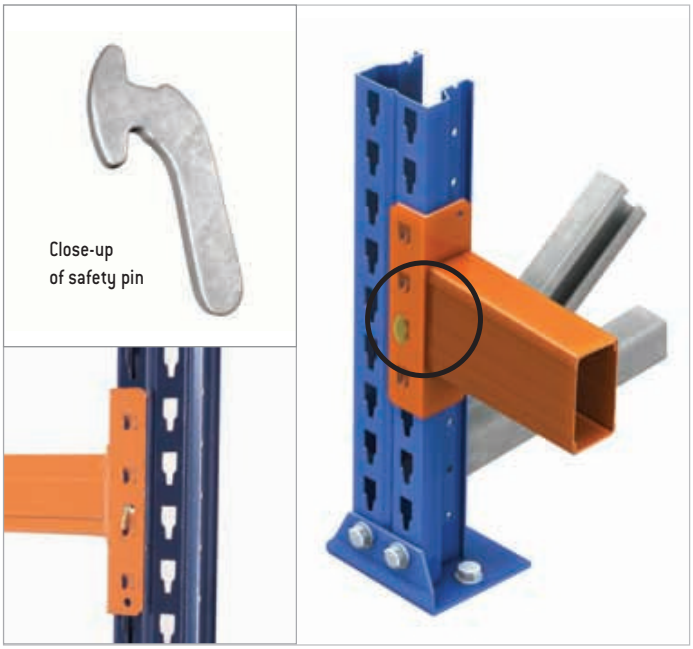
(in mm)

Beam safety pin

Metal safety pins are designed to prevent a rising vertical impact from accidental prising of the beams out of their slots. They are inserted into the holes in each connector.

As safety pins are important safety elements, each beam is fitted with two, one for each end connector.

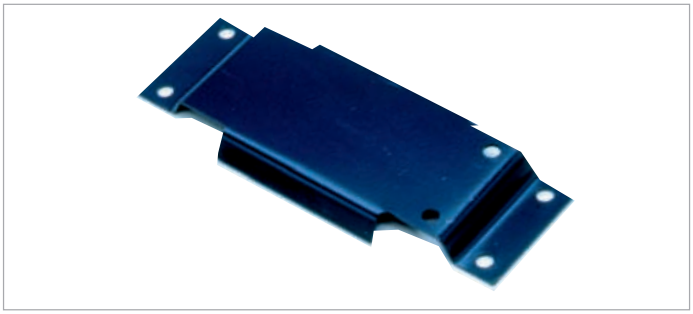
They are manufactured in a dichromated finish.



Row spacer

Row spacers are steel sections. They are shaped to fit the upright profile and are secured by four bolts.

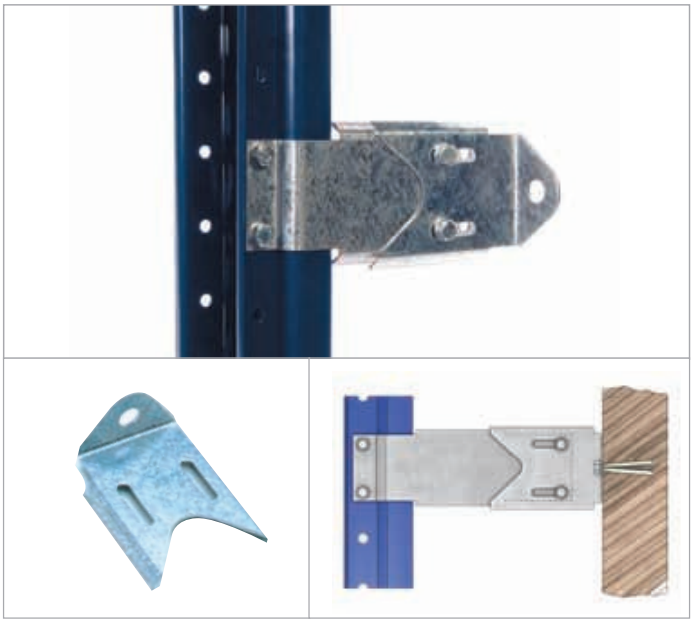
They are used to join double-entry racks together, thus giving them greater structural stability.



Wall tie

Wall ties are used to join single-entry racks to the wall, enabling greater structural stability.

They are fitted as close as possible to the diagonal joints of the frames. An adapter is used to bolt them to the wall.

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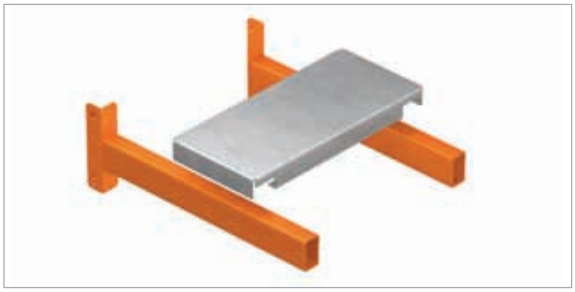
2
3

Shelves

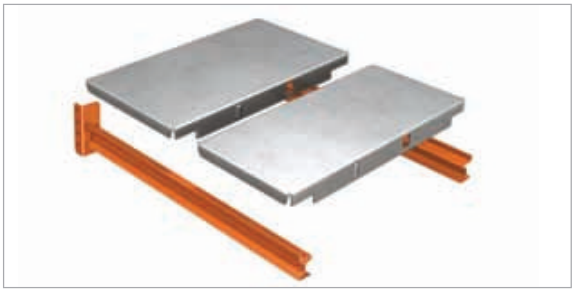
Different types of shelves are available enabling various requirements to be met. The most commonly used are:

L-2C galvanised shelves



These metal shelves can be fitted onto 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.

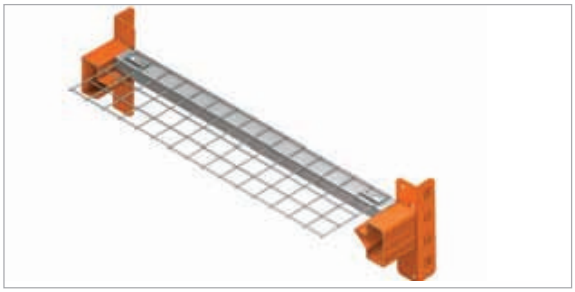
Inset chipboard shelves

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 loading required.

Chipboard shelves

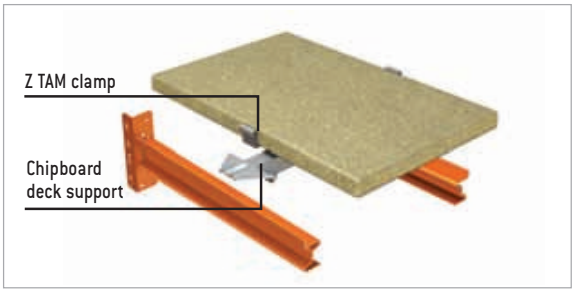
Chipboard shelves can be fitted on 2C beams with the aid of 4 retainers. Chipboard deck supports can also be used.

Inset 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 J or Z beams and do not require further securing.

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 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 the vertical components from local damage.

Upright-frame protector

Each type of upright has its own type of protector or guard. 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 in facilities where forklift trucks operate.

Upright-frame protector.

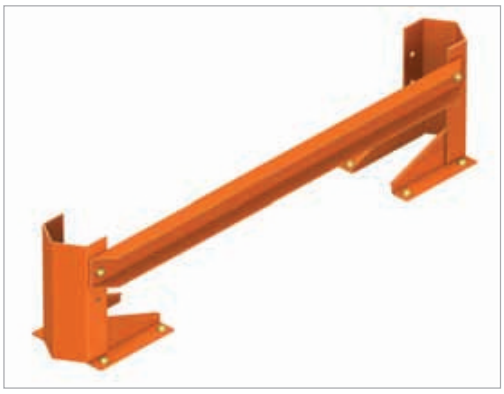
Corner protectors

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.

Corner protector.

Lateral frame protection

These protect the side of the rack base. It is normally fitted to end frames and in passageways between frames where impacts are more vulnerable. Each upright type has its own protector. In order to protect the entire side of a frame, two upright protectors and one UPN profile are used. Two UPN profiles can also be fitted if the client wishes.

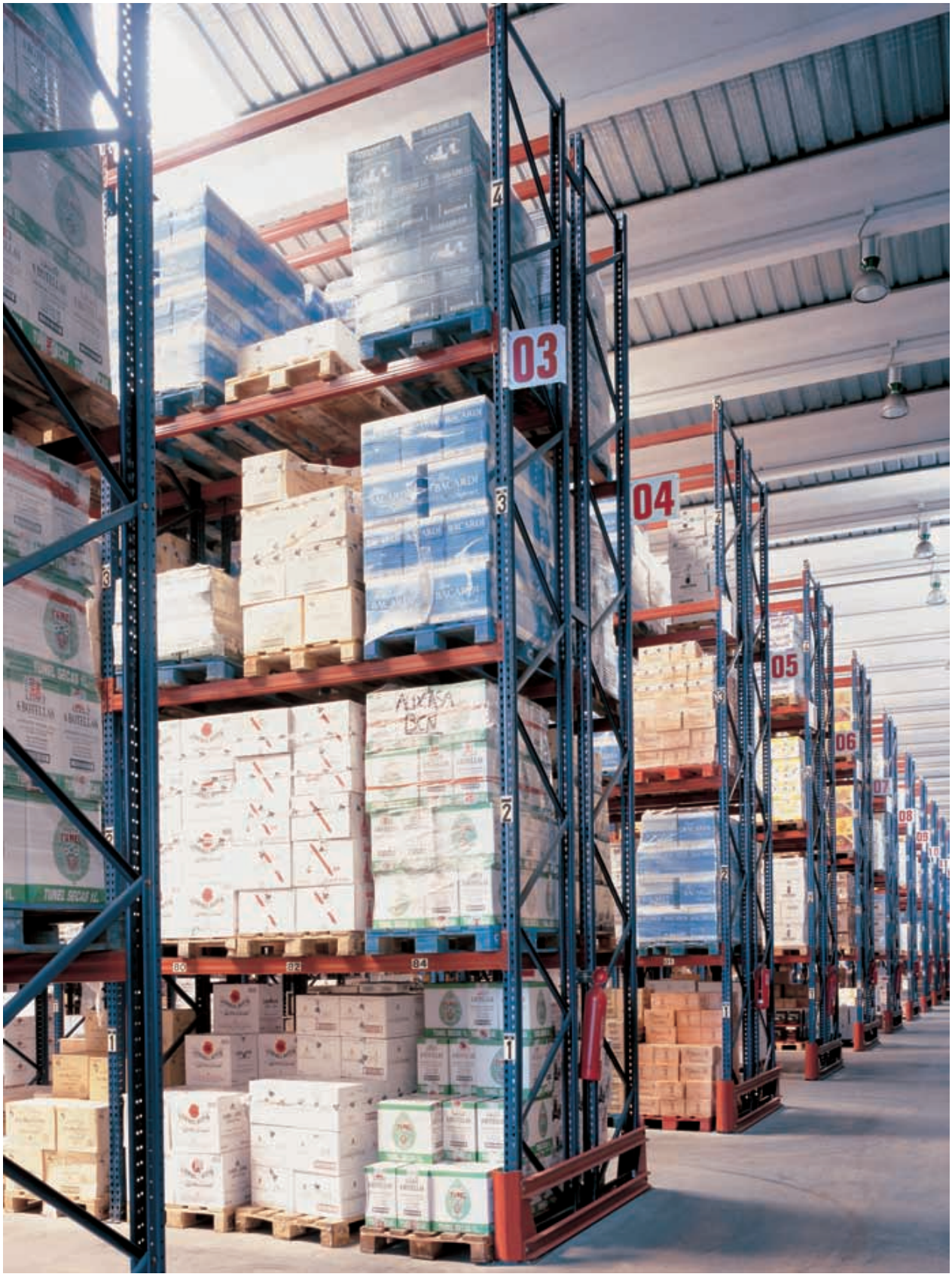


Lateral frame protection.

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 wedge-shaped folded sheets and bear holes along their sides so they can be fixed to the upright. Each upright type has several reinforcers available in different heights.

Upright reinforcer.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Pallet and Stillage Container Supports

Depending on how the pallet or stillage container is placed on the rack a further support in addition to the beams may be necessary such as pallet or container supports.

Galvanised pallet supports

These are fitted perpendicularly to the beams and are used to provide support to pallets when they are placed on the rack with the lower stringers parallel to the beams. Two are needed for each pallet.

Available in a galvanised sendzimir finish.

Raised pallet supports

These are used when goods are stored without pallet support or dunnage.

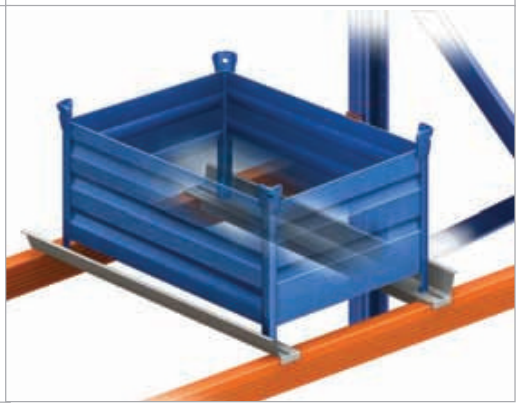
Stillage container support

This component is fitted when stillage containers with legs are stored in racks.

Two supports are used per container, one on the right and one on the left. The stillage container supports can be fitted with end-stops which are bolted to the top of each support.

Galvanised container support

End-stop for container support.



Container support.

Cylinder and Drum Supports

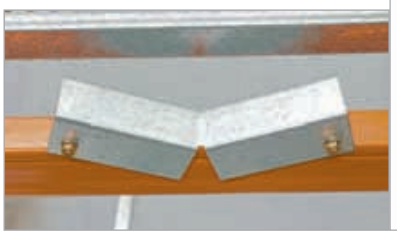
2L Cylinder support

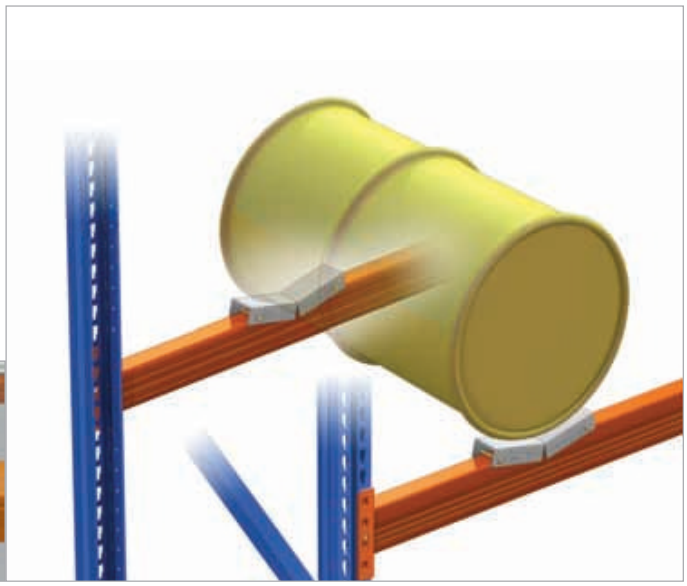
This set is made up of two L-shaped profiles joined by two front profiles which form a cradle frame enabling the cylinder to be correctly placed. They are fitted laterally across the beams.

Front drum support

These are V shaped metal C sections which are fitted to the 2C beams range, enabling the load levels to store drums.

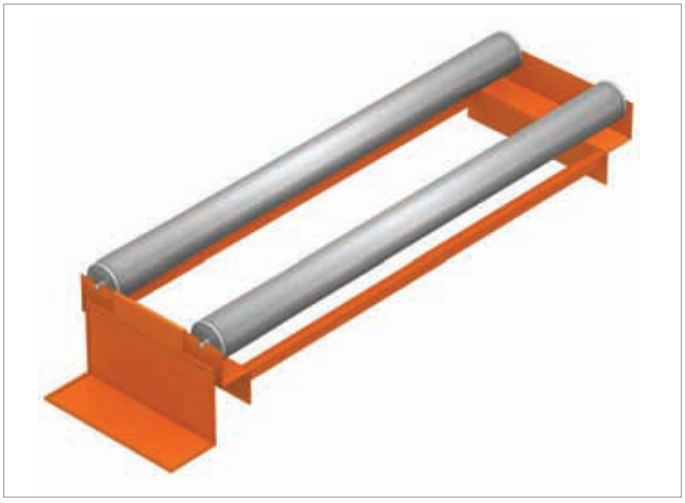
The drum support is placed horizontally on the front beam and is then fitted in a V-shape so as to allow drums and reels to be properly supported.





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.



Reel Supports

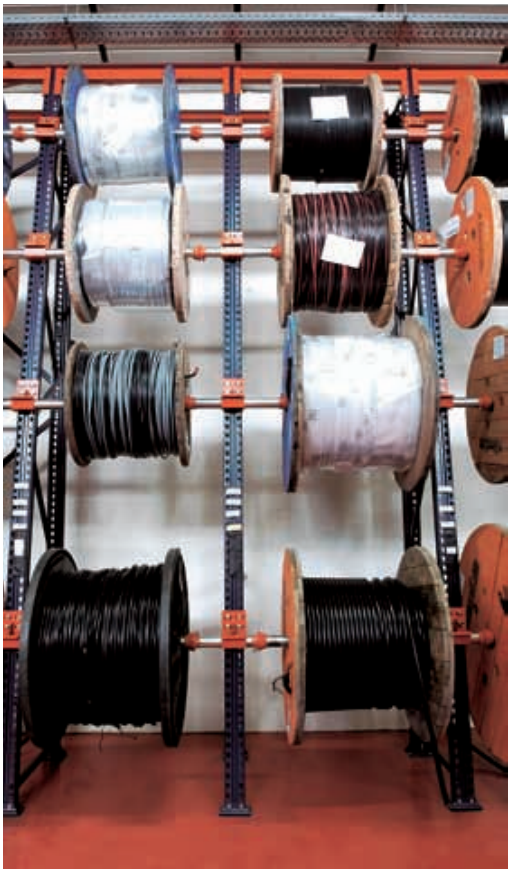
Reel supports enable cylinder-shaped articles to be stored on a metal axle (cable reels and paper reels, etc.).

Two systems are available; front storage and side storage; the choice depending on the characteristics of the goods, their sizes and their use.

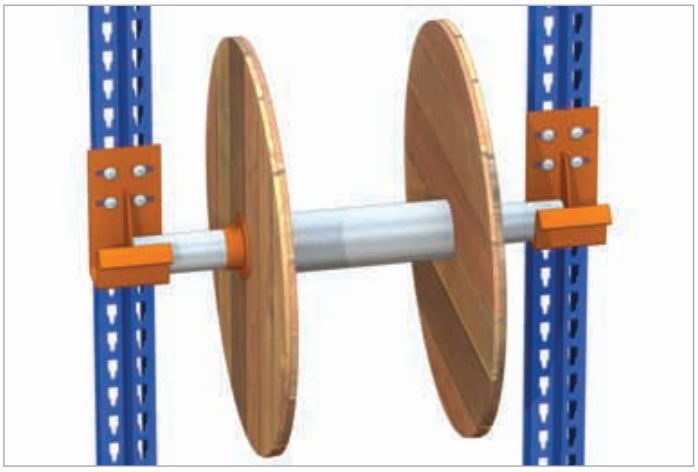
Support axles and collars are available as accessories. They prevent the reels from slipping sideways.

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.

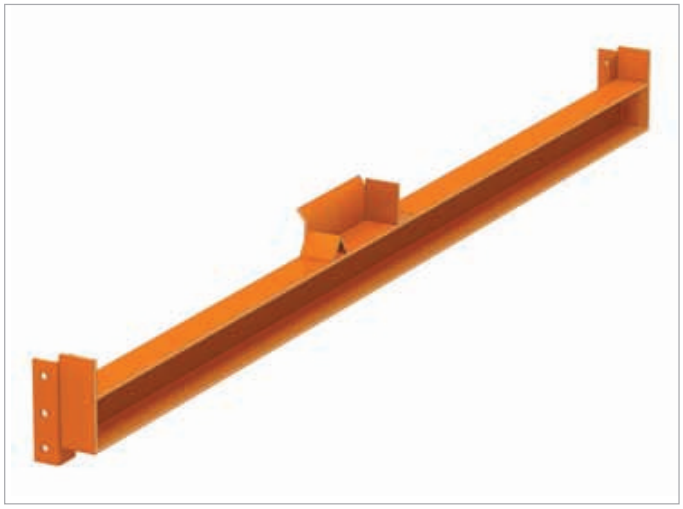


Front reel support.



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.



Side reel support.

Support axle and collars

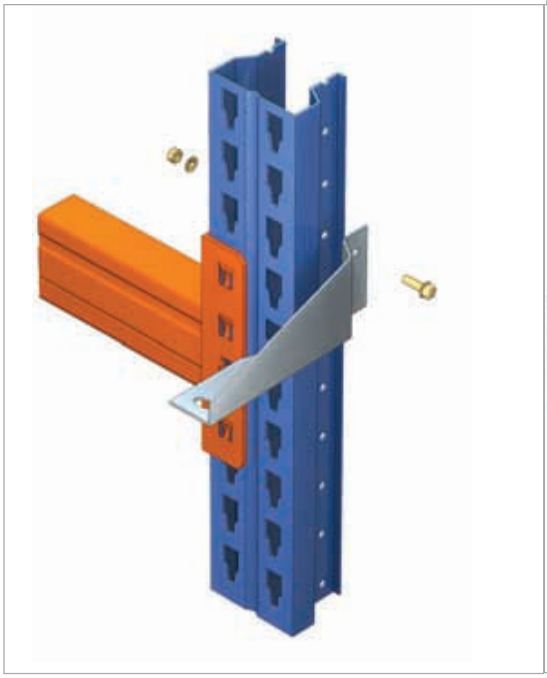
The axle is tubular with a diameter of 60 mm which is available in different thicknesses. It is used as an axle on which the reels can rotate.

Guidance is via conical-shaped adjustable collars which are used as end-stops to prevent products from slipping along the axle.

Pallet Back-Stop

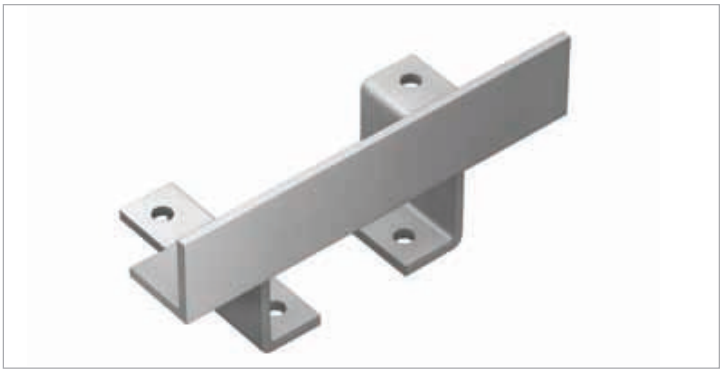
C-profile metal section that prevents the pallets from sticking out of the back of the racks. The pallet back-stops are basically used to prevent the pallets from falling, hitting or pushing into other pallets in the opposing bay, whilst loading and unloading.

Their use is advisable in facilities where vertical cross-bracing has been fitted as they prevent the rack from being hit by pallets. They should also be fitted where pallets are stored very close to each other or in busy aisles to prevent the pallet from falling, or to protect the walls from being hit.



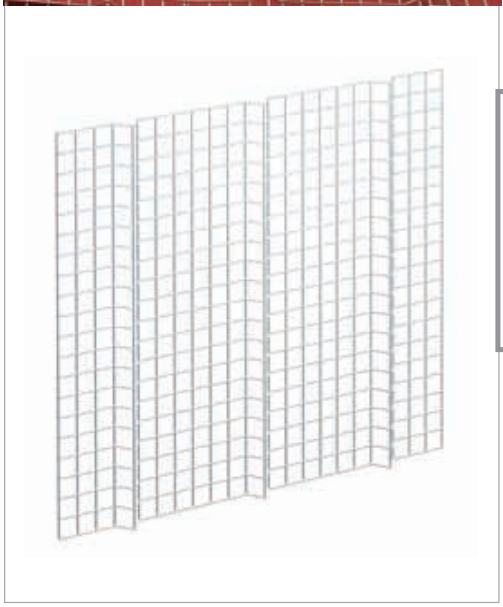
Floor mounted pallet back-stops

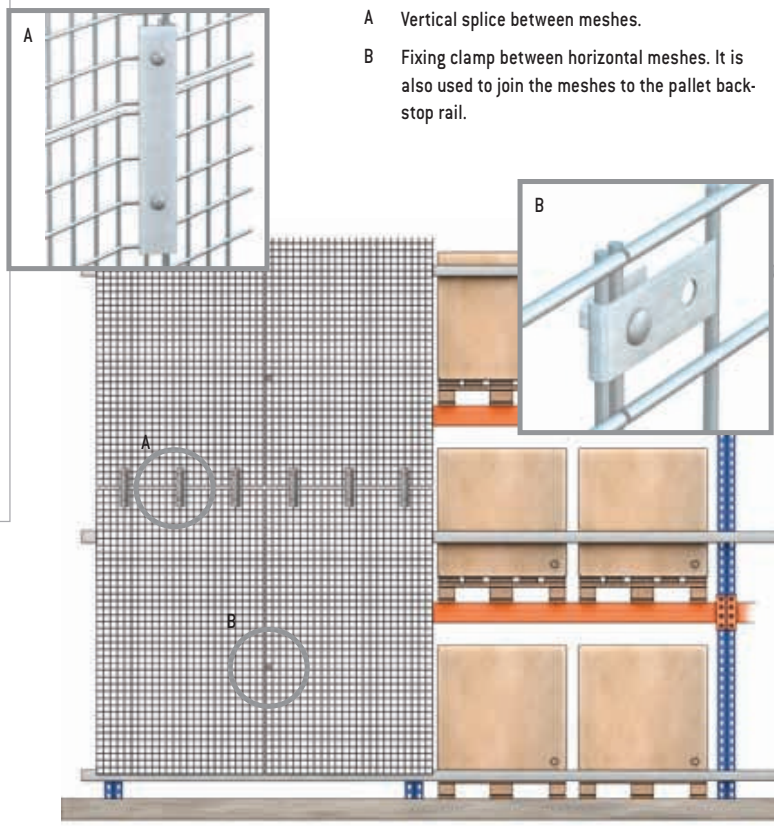
These components are anchored to the floor to protect cross bracing, walls and objects.



Protective Mesh

Protective mesh is fixed to pallet end-stops to prevent goods stored on pallets from falling. It 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.





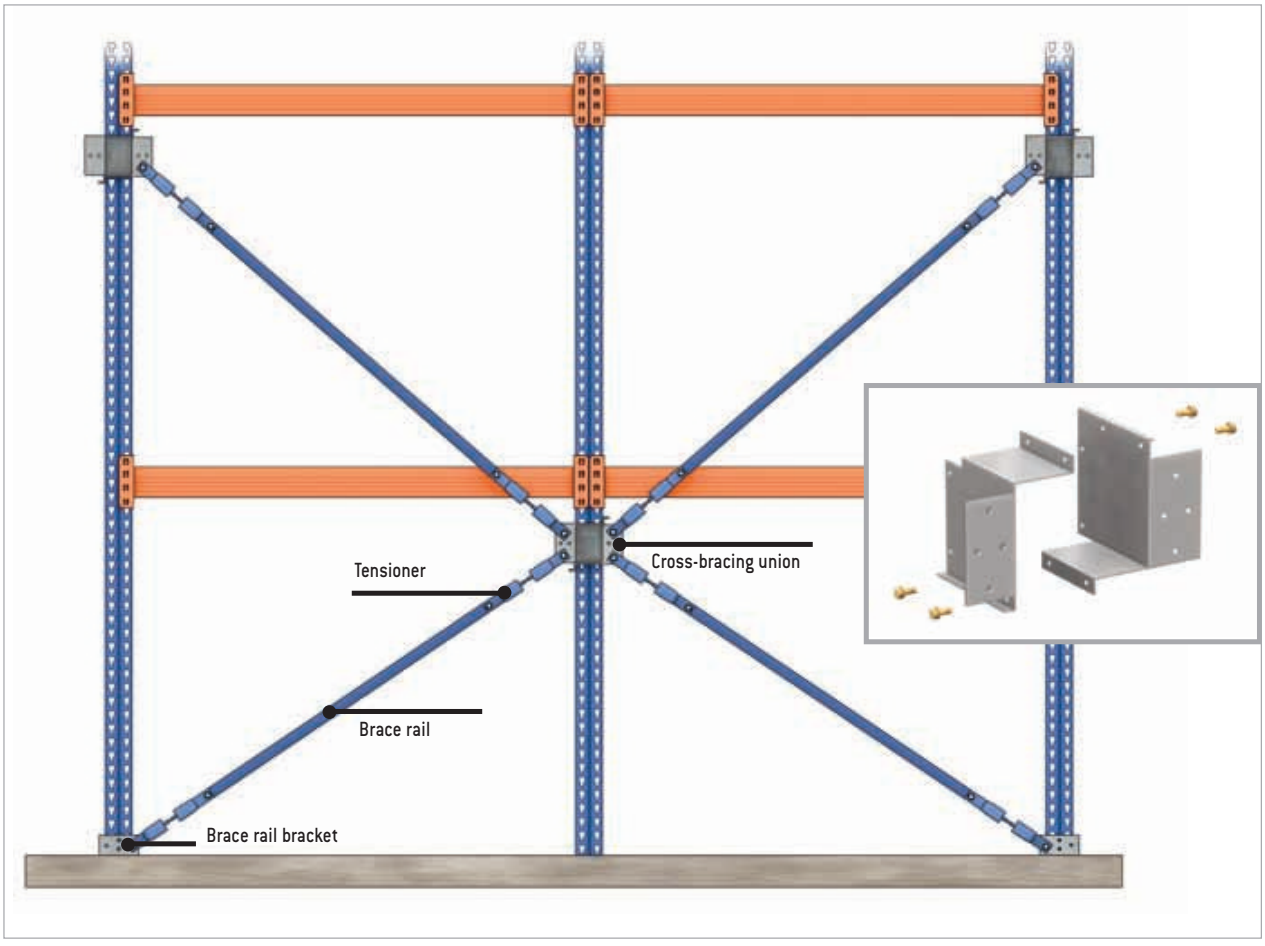
A Vertical splice between meshes.

B Fixing clamp between horizontal meshes. It is also used to join the meshes to the pallet back-stop rail.

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 installation requires this because of height and load.



Frame Splice

For higher installations, where the maximum height of the frame exceeds 12,000 mm, a frame splice set is required. It is made up of two symmetrical frame splice pieces which are bolted on the inside of the uprights to be spliced.

Location accessories for identification

Aisle location plate

Rectangular metal sheets fitted onto the end of racks enabling letters or numbers to be attached and thus the racks to be identified. They can be fitted in three different positions depending on the angle of vision desired.

Cardholder for uprights

Designed to house identification cards which need to be changed from time to time.

Flat cardholder

These enable fixed identification cards to be affixed.

Load safety notice

These plates enable the technical specifications of the installation to be identified. They are displayed in visible areas at the end of the racks.


24
25
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These warehouses are made up of high bay racks separated by narrow storage aisles.

The chief advantage of these warehouses is their excellent use of space and their direct access to any stored pallet.

Turret trucks or stacker cranes are used to handle the load units.

Racking for turret trucks

Turret trucks are heavy-duty vehicles designed for working in narrow aisles with generally 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.

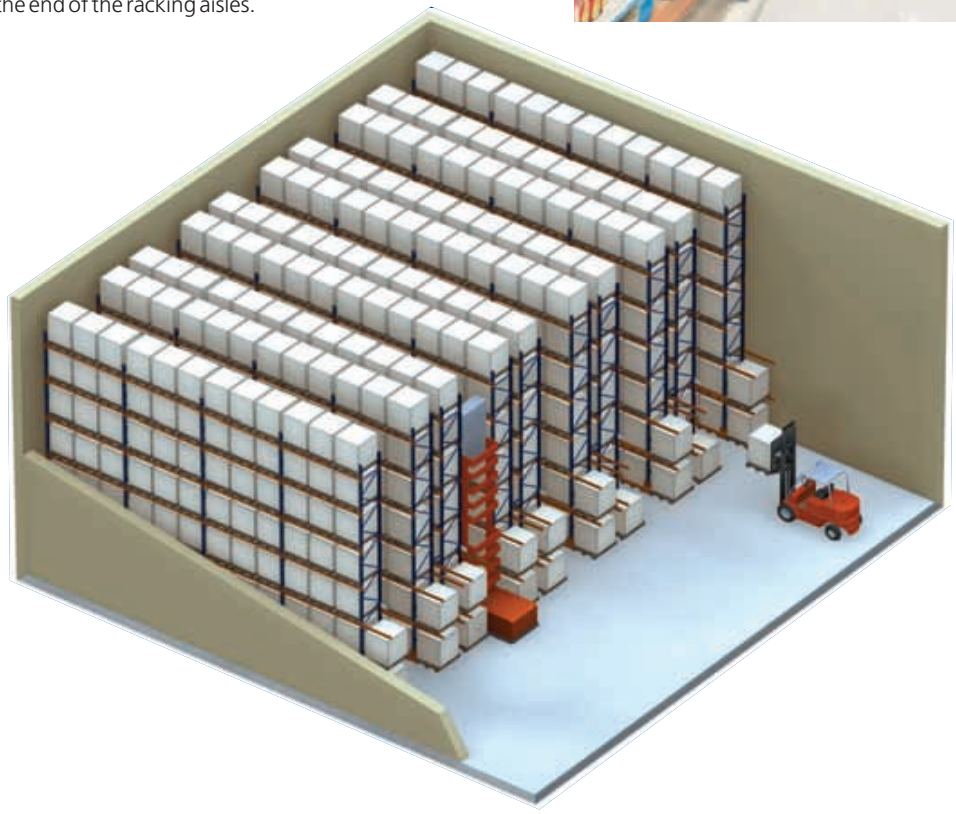
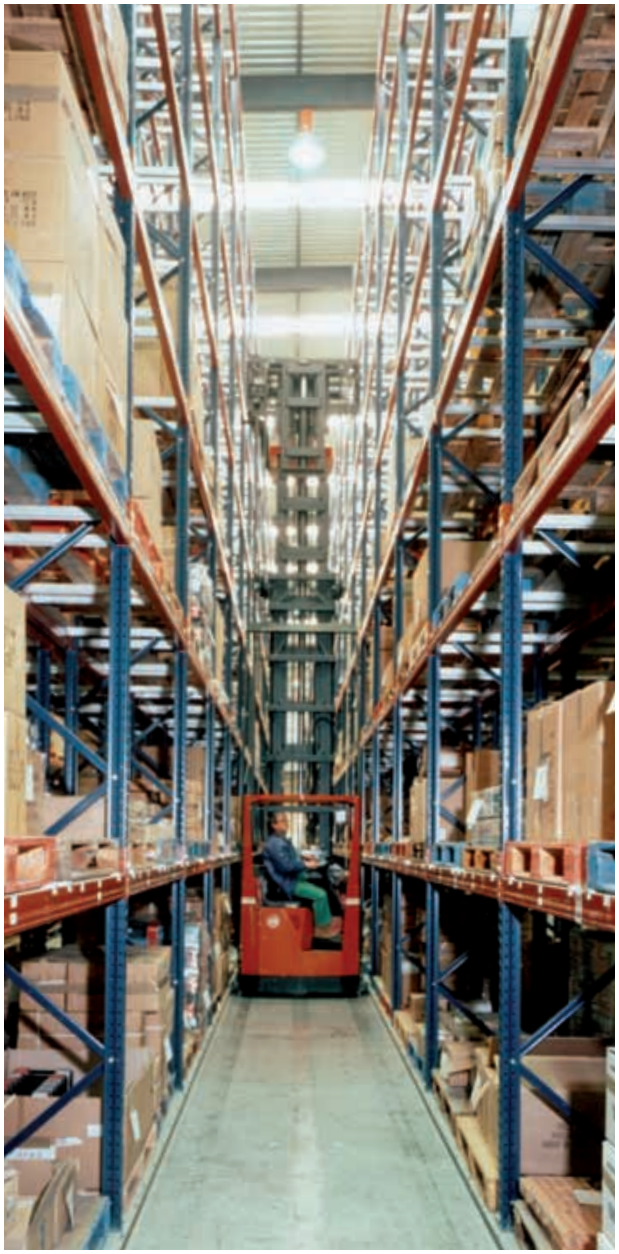


Illustration of a high bay pallet racking warehouse.

Turret Truck 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 B)

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: three-position and two position.

Three-position fork
Three-position 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.

Two-position fork
Two-position forks can only pick up and leave pallets in a raised position and so cannot pick them up directly from the floor. The installation can be higher, though the aisles in this case are narrower.

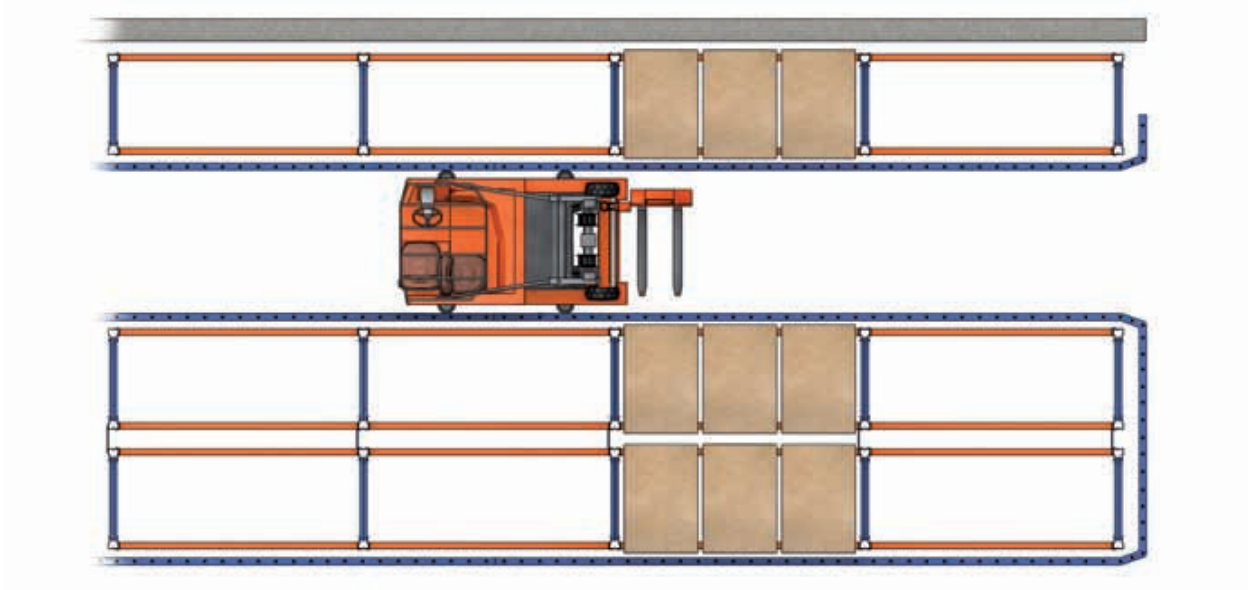
Three-position forks in insertion/extraction position.

Two-position fork.

Three-position fork in circulation position.

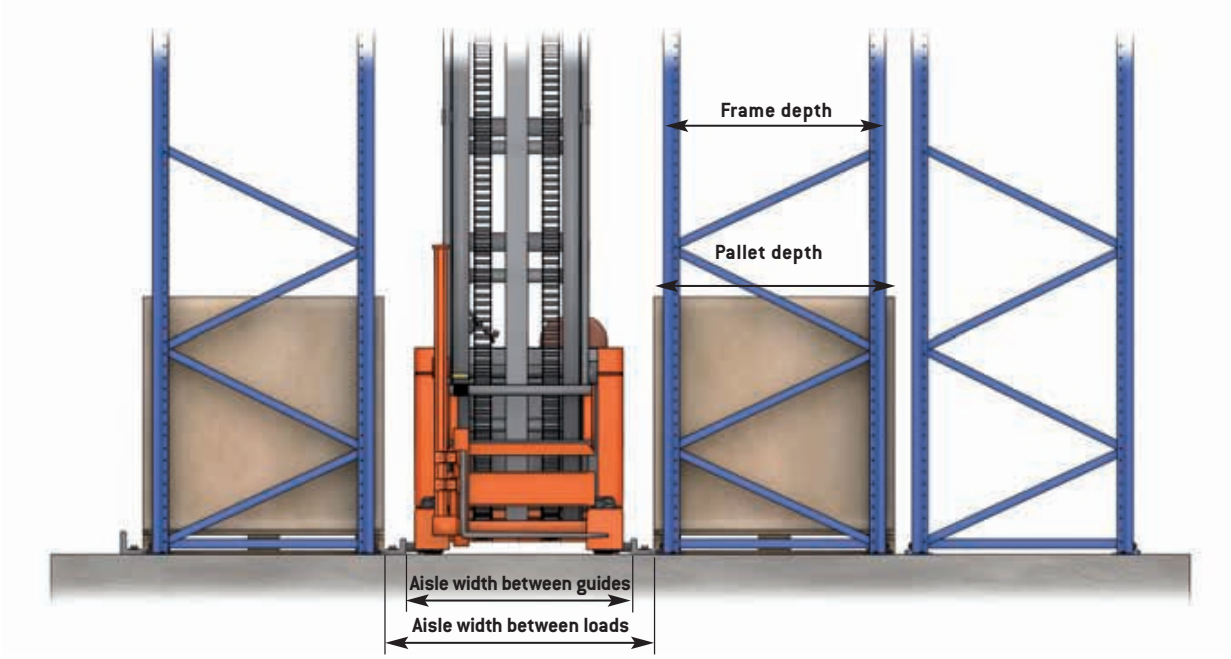
Guidance Systems for Turret Trucks

Turret trucks must be guided along the inside of storage aisles. The vehicles can be wire-guided. In this case, a wire is buried in the slab and gives off a magnetic field which guides the movements of the truck, or mechanical guidance by means of profiles fitted on both sides of the aisle and anchored to the slab.



Mechanical guidance. General layout.

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.



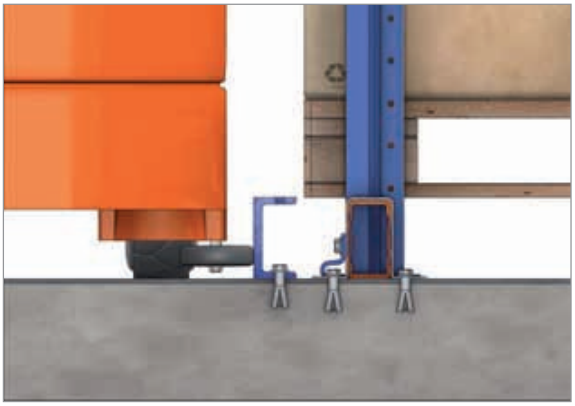
Mechanical guidance. Measurements to be taken into account.

Guidance with LPN 50 floor profile

The pallets are supported directly on the floor.

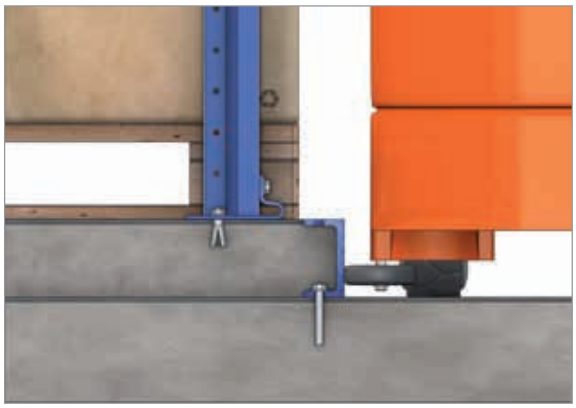
Guidance with a UPN 100 floor profile

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



Guidance with a UPN 100 floor profile forming concrete platform

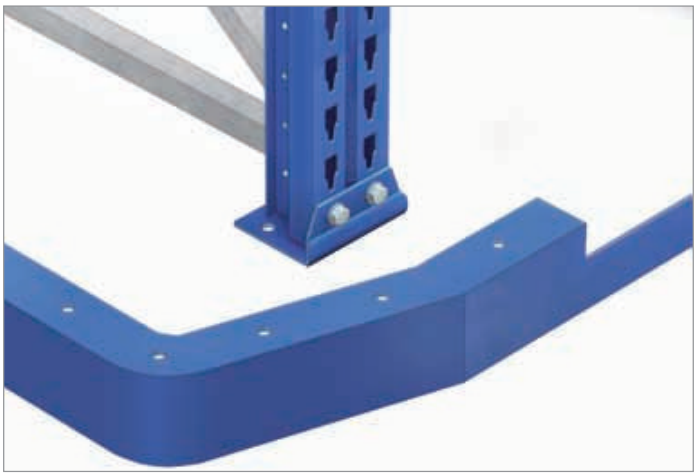
The space between the guide rails under the racks is filled in with concrete. The racks are built on top of the concrete platform.



Wire-guidance

A wire buried in the floor produces a magnetic field which guides the vehicle.

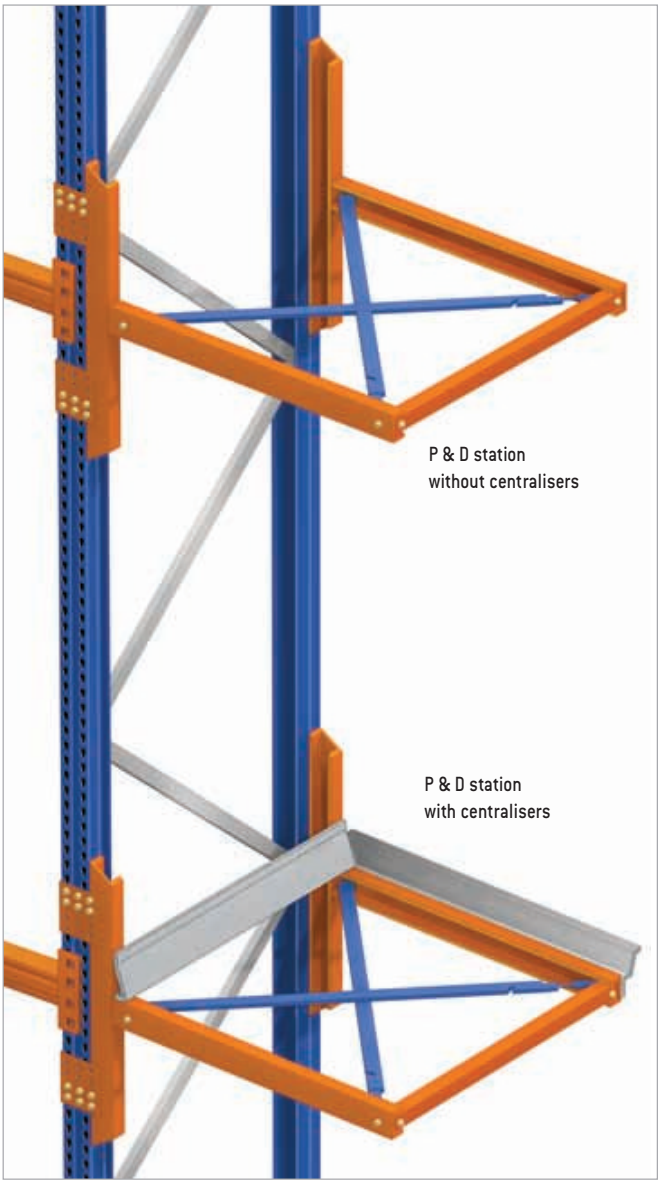
In the aisle entry with mechanical guidance, entry profiles are fitted with guidance entry rails in order to help centre the vehicles.



Pick & 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.

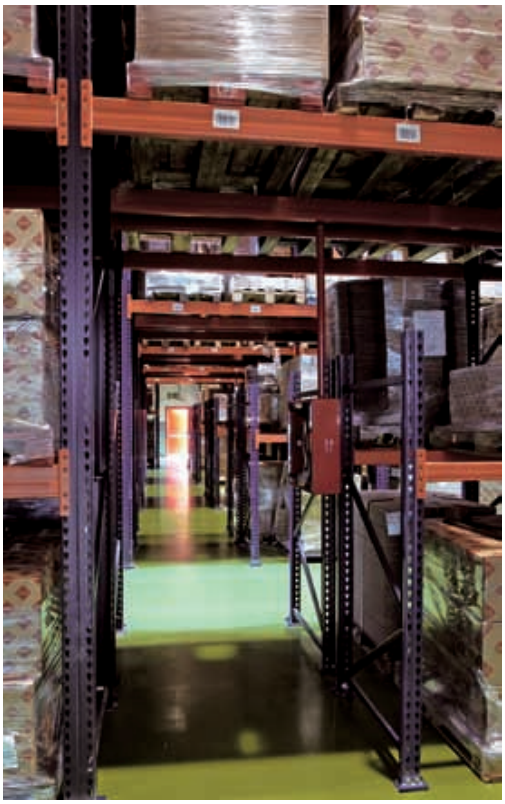


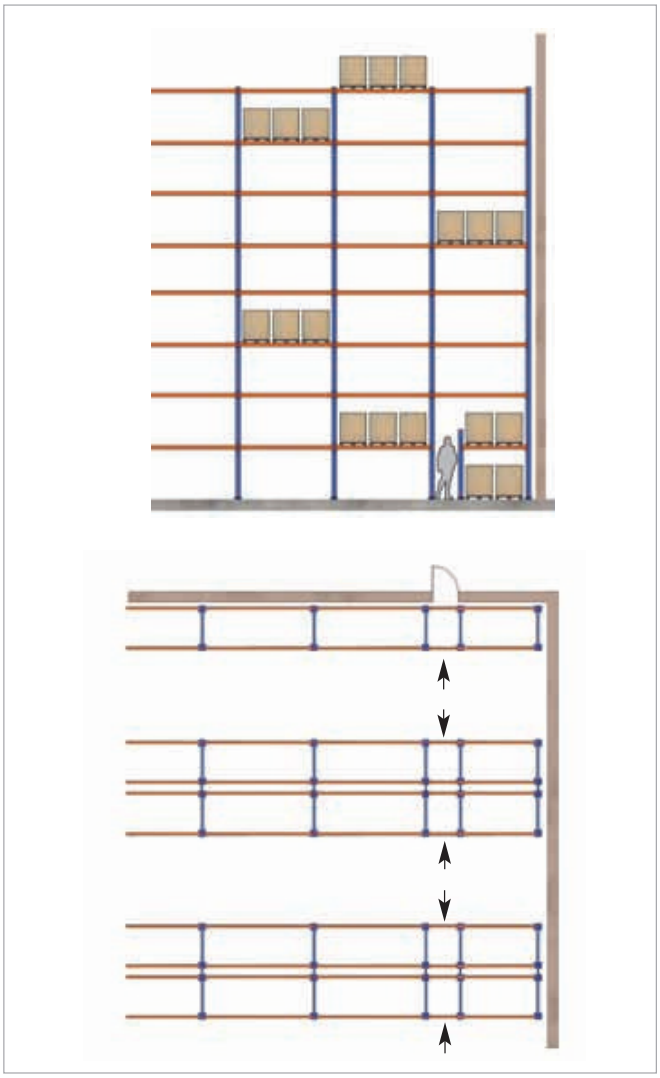
A number of different P & D stations are available. They have been designed to cover different needs, number in height, sizes, loads, etc. P & D stations can also be fitted with pallet centralisers which enable pallets to be positioned with greater precision, so enabling their placement in locations with lower tolerance margins.

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

Safety passageways

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





Top portal tie

High-bay racks are often connected together at the top by portal ties.

These portal ties must be fitted above the maximum reach height of lifting device, including the mast and the cabin.

Fire-protection systems

High-bay racks are usually fitted with a fire-protection system built into the racks.

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.