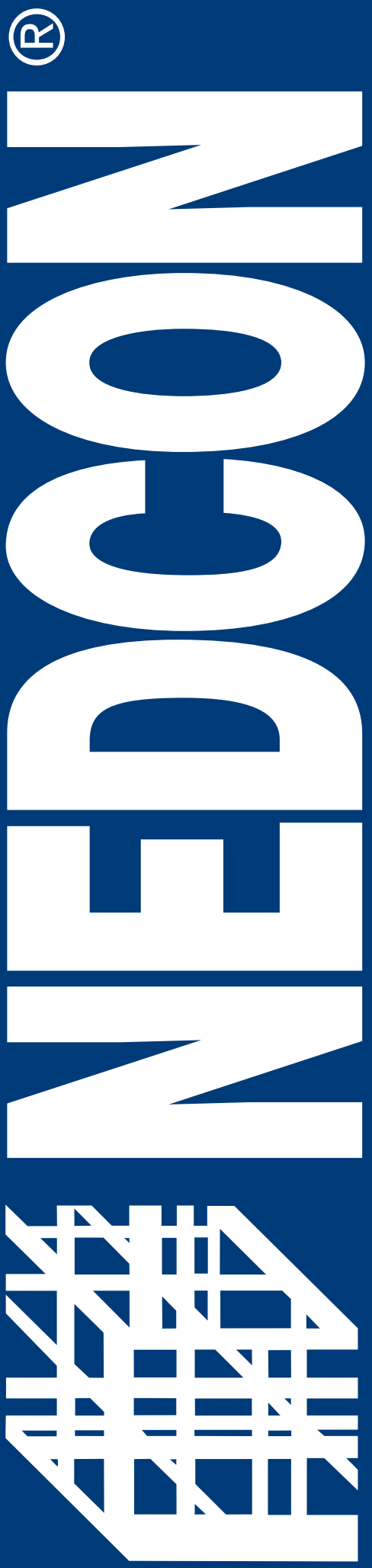

NEDCON®
advanced
storage
technology

NEDCON®
advanced storage technology

Storage solutions

Solution-focused by nature

NEDCON®
advanced storage technology

Nedcon Groep N.V. is a member of the Division Profilform of the Voestalpine group
Nedcon Groep N.V. holding company of the following

NL **Nedcon Magazijninrichting B.V.**
Nijverheidsweg 26
7005 BJ Doetinchem
P.O. Box 35
7000 AA Doetinchem
The Netherlands
T +31 314 33 44 55
F +31 314 37 94 44
E info@nedcon.com

USA **Nedcon USA Inc.**
136 Harrison Avenue
Harrison, OH 45030-0708
USA
T +1 513 367 2656
F +1 513 367 2807
E sales.usa@nedcon.com

D **Nedcon Lagertechnik GmbH**
Dinxperloer Straße 18-20
46399 Bocholt
Germany
T +49 2871 47 89
F +49 2871 48 516
E sales.d@nedcon.com

F **Nedcon France SAS**
Bâtiment Sapfir
5, Rue du Parc
67205 Oberhausbergen
France
T +33 388 560 555
F +33 388 562 237
E b.thomas@nedcon.com

B **N.V. Nedcon S.A.**
Generaal Dewittelaan 17
2800 Mechelen
Belgium
T +32 15 40 43 40
F +32 15 46 09 03
E sales.b@nedcon.com

CZ **Nedcon Bohemia, s.r.o.**
Holandská 34
533 01 Pardubice
Czech Republic
T +420 467 002 111
F +420 467 002 257
E sales.cz@nedcon.com

Besides the mentioned branches Nedcon is represented in many other countries through its expanded network of professional resellers. For detailed information on the whereabouts of these resellers please visit www.nedcon.com.

NEDCON®
advanced storage technology

Introduction

Established in 1969, Nedcon has developed into a leading producer of advanced storage systems and now has production locations both in Doetinchem (NL) and Pardubice (CZ). Nedcon is part of **voest**alpine Division Profilform since August 2004.
Our commitment to quality and to continuous research, development and testing has given us a large portfolio of components. Many of these are covered by international patents.

The high demands on product tolerances and safety require precise constructional specifications for each type of racking. Nedcon offers systems that meet the high standards of modern storage technology through advanced engineering methods and inherent safety features.

For decades, Nedcon has taken a leading role in national and international regulation and standardisation.
Our standard rack systems are supplied with GSF-Certification, a quality mark that is monitored by TNO-Certification, an independent testing institute.

Pallet racking

Drive-in racking

Shelving

Wide span shelving

Verband für Lagertechnik und Betriebseinrichtungen

Overview

of available Nedcon documentation

NEDCON®
advanced storage technology

Company Profile

Storage systems for palletised goods

Storage systems for small parts

Storage systems for specific goods

Rack protection and safety

Storage systems for palletised goods

Advanced storage technology

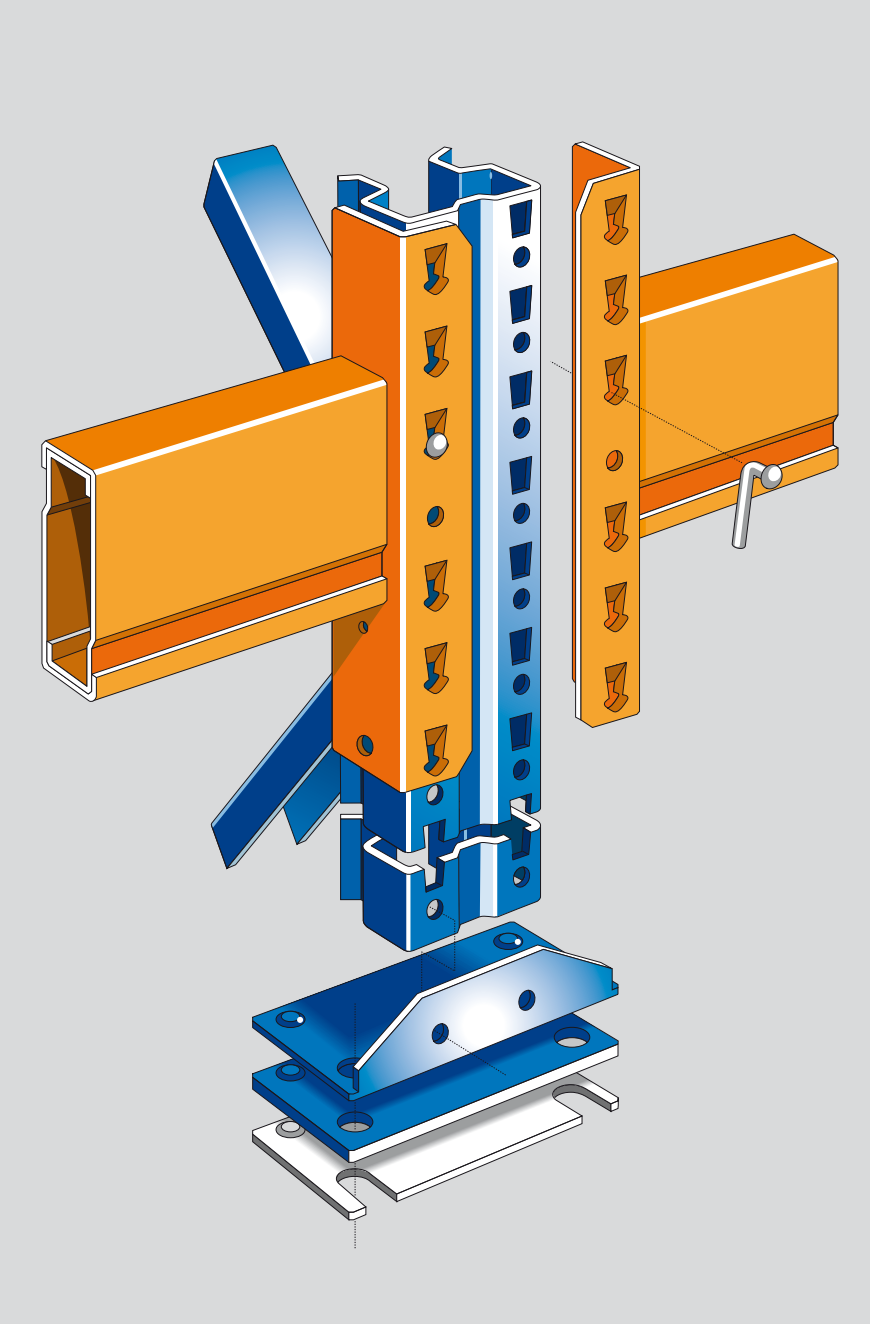
Pallet storage

Nedcon's extensive range of integrated pallet racking components offer safe and effective storage of all sizes and weights. Innovation, scientific and practical research, use of certified steels, high-quality epoxy powder coating and carefully selected components characterise all Nedcon pallet racks. Sometimes a more original approach is required when confronted by a particular application. Nedcon can then supply the ideal solution by selecting from this range of components.

Hook-in connectors allow for easy height adjustability and ensure quick and efficient assembly.
Often, bracing in the horizontal and vertical plane is undesirable due to lack of space. The stability and the strength of the racks are then determined to a large extent by the properties of the hook-in connections.

The hook-in connection is the heart of all unbraced pallet racking.

Poor fitting or inadequate design lead to reduced strength with regard to angular torsion; giving a reduction in the rotational spring constant (Cv) and reduced flexural moment capacity (Mv). The joints behave like hinges, allowing increased beam deflection and instability.

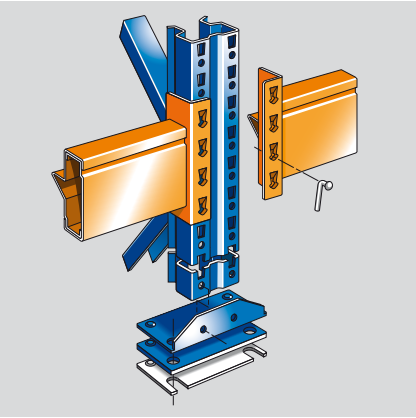


The heavy-duty hook-in connection is an extra strong model of the standard hook-in connection, which still fits into the same standard perforation. Height adjustability is 50 mm. The height of the beam end-connector is 350 mm, so that this connection can also be used with mezzanine floor systems.

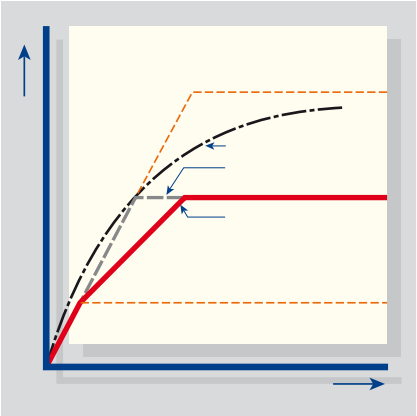
The heavy-duty hook-in connection is ideally suited for unbraced and heavily loaded, high structure racks due to its exceptionally high rotational stiffness.

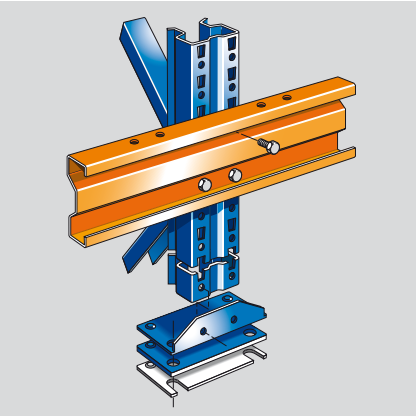
Locking

To prevent the hook-in connectors being dislodged by any upward force, they are secured with a solid safety pin with a diameter of 10 mm; these fit into the upright perforation with a minimum of clearance.



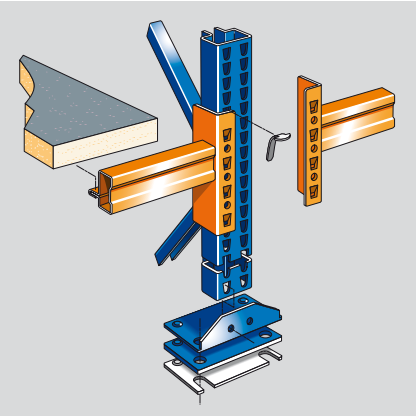
The **standard hook-in connector** fits into the conical upright perforations without any clearance. Height adjustability is 50 mm.
The height of the beam end-connector is 200 mm. These are made of high-quality micro-alloy steel.



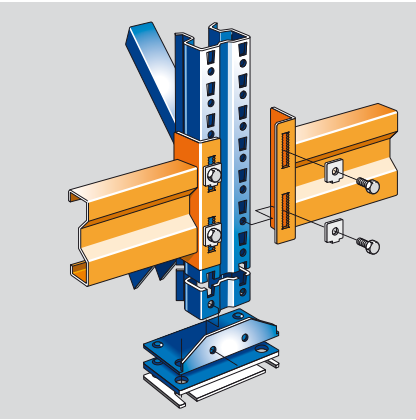


The **bolted connection** can be used when adjustability is not required, and bracing is not a problem. With this, multi-span beams are used to reduce beam deflection.

Nedcon has developed various types of connectors, each with their own specific application. Each type has been stringently tested by TNO-Construction in accordance with the NVN Standard 5053, in compliance with the Arbo (Health & Safety) Information Sheet AI 14 of the labour inspection.



For **wide-span shelving** there is also a hook-in connector, allowing height adjustment of 25 mm, available. The height of the beam end-connector is 200 mm. It has excellent rotational strength, so is suitable for the construction of high racks.



A fully patented **infinitely adjustable connector** is used for live storage racking.

Existing installations, which are fitted with our 100 mm connector can still be supplied.

Frame constructions

The Nedcon engineering department has available a wide range of combinations of upright frames and beam types for the safe design of racks up to a height of over 30 metres.

The frame diagonals can be chosen such that the optimum buckling length can be achieved for every possible combination of height and depth.

There are 36 types of upright profiles available, each of which differ in shape, dimension, effective material cross-section and thus in load-bearing capacity. All types are made of high-quality micro-alloy steel, so they can also be installed in cold stores.

The upright frames are assembled with bolted or riveted connections. They can be assembled on-site, or in production by Nedcon.

Bolted frame bracing

The junction in the frame between an upright and two full width diagonals is bolted. The ends of the diagonals are fitted with a bend part to avoid deformation by the bolt connection.

This joint being symmetrical, the upright will not twist under the effect of horizontal forces. This form of frame bracing is necessary for high-rise rack constructions, which have to conform to the tolerances as laid down in FEM 10.3.01 and FEM 9.831.

Use of the high-bay system means that the admissible frame load is high, as 30% less buckling length may be taken into account, in accordance with FEM 10.2.02 and Eurocode part 1.3 for high-bay systems.

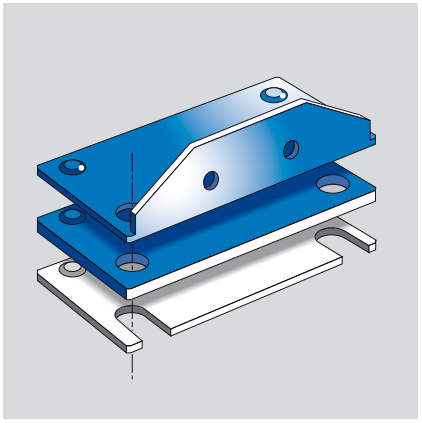
Upright profiles

These profiles are cold-rolled and perforated very accurately under electronic control in our own factory and can be produced in lengths of up to 14 metres in epoxy powdered finish or sendzimir galvanized.

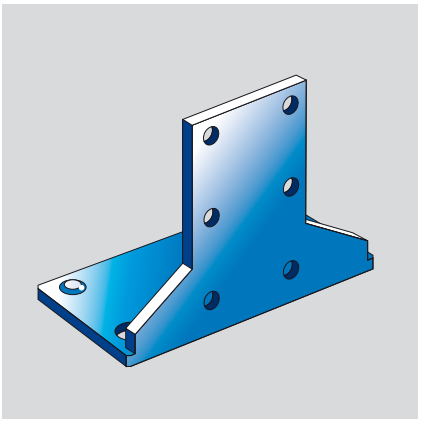
Upright profiles are available in 30, 45, 60, 80, 100, 120 and 140 mm widths and in a range of material thicknesses (t).
Tests by the TNO have shown that the cross-section of all profile types is 100% effective due to our chosen design.

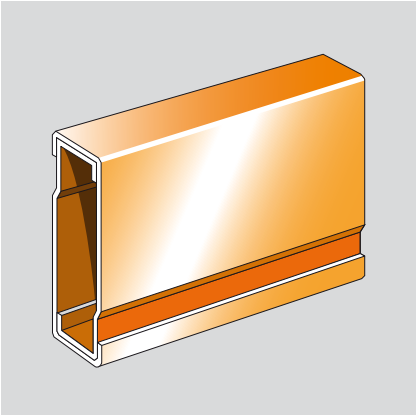
Base plates

The upright profile transmits a point-load on the floor via the base plate. The dimensions, type of steel, material thickness and any extra pressure distribution plates ensure sufficient spreading of this point load. Stiffness and strength at fixed ends - in other words, the extent to which the upright profile cannot hinge freely on the base plate - is primarily of importance with unbraced racks. This is tested by TNO-Construction (NVN 5053 Standard). With the right choice of upright width and base plate, load-bearing capacity of the frame can be increased by up to 30%. To accommodate tensile forces, the base plate is flanged and provided with two anchor holes.



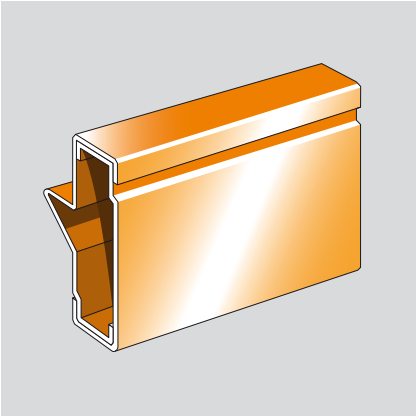
Special base plates are used when very high tensile forces need to be accommodated, in silo construction for example.





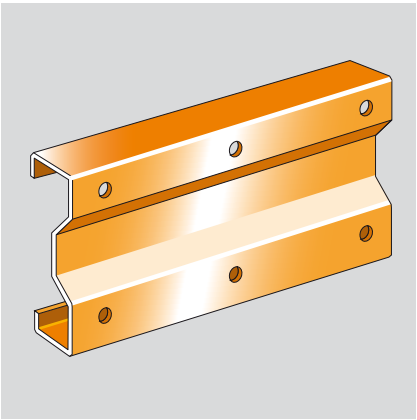
Beams, type CC

This beam type is available in a wide range of height and width dimensions, and in lengths up to 4,500 mm. The box shape is highly resistant to torsion and provides great strength and stiffness in the vertical and horizontal planes. Wide profiles are recommended for beam profiles in excess of three metres.



Beams, type NC

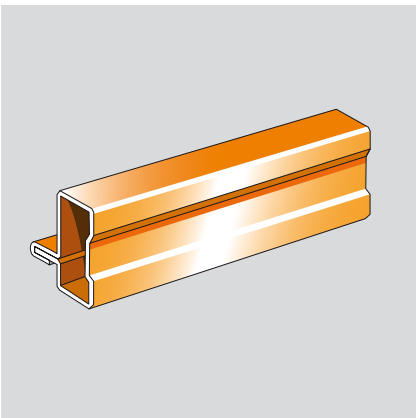
This beam type has the same properties of the type CC. But these NC beams have a profiled shelf support edge, suitable for use with recessed shelves, mesh panels and pallet supports.



Beams, type Sigma

This open profile is resistant to torsion, due to the careful design of the cross-force centre, whilst maintaining excellent load-bearing capacity.

Perforated Sigma beams are ideal for use with suppplements that are bolted, as with pallet live storage.



Beams for wide-span shelves

Box-shaped beams, highly resistant to torsion, with less profile height than the type CC, are used for wide-span shelving.

In the perforated form, these beams are used in beam type miniload systems.

Load-bearing capacity of beams

The load-bearing capacity of the beams is indicated by bay, thus per pair of beams and assumes an even distribution of load over the length of both beams. However, the load at the back may overhang more than at the front, and some goods can create point loading. In these cases, the load-bearing should be reduced in accordance with a supplementary calculation. If the operating equipment creates extra dynamic forces, this should be stated, in order to determine the precise load-bearing capacity.

Beam deflection

Independent of the load-bearing capacity of the beams, deflection will occur due to loads used. This deflection is reduced as the height of the beam profile is increased. The height effects bending in the third power.
The thickness of the material is only of linear influence on the bending.
The standard for deflection in pallet racks, is maximum 1/200 of the beam length. With long beams and in automated storage systems, deflection is limited to 1/300 of the beam length, in accordance with FEM guidelines.
The choice of hook-in connection will also have a considerable influence on beam stiffness.

Lateral stiffness of beams

When horizontal forces can occur, especially with long beams on which more than two pallets are positioned alongside each other, careful thought must be given to the lateral stiffness.
In general, right-angled box profiles behave two to three times better than IPE-profiles. The box profiles are available in widths of 40, 50 and 60 mm, so that sufficient stiffness can be accommodated in all circumstances.

Sprinkler brackets

Sprinkler systems can be accommodated simply and easily during the rack construction by using face mounted and in-rack pipe support brackets.

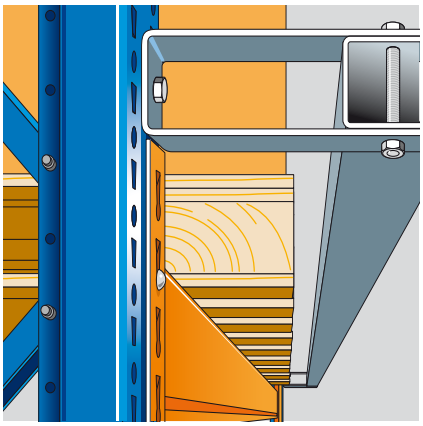
Pallet supports

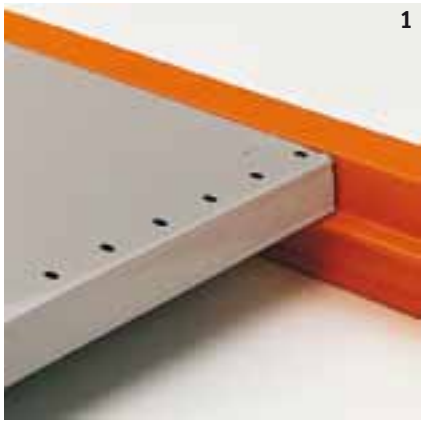
Depending on their quality, it may be necessary to improve the bearing of pallets with pallet supports:

- model with welded hooks for fitting on CC-beams.
- model for fitting on the shelf support edge on NC-beams.
- model for fitting on a shelf support edge with perforations, for sideways fixing.

Push-through protection

If the clearance between pallets in a double entry pallet rack is 100 mm or less, push-through protection can be used. This will prevent the rear pallet being moved when the front pallet is positioned. However, when using forklift trucks, there is the risk that excessive horizontal force could be applied to the rack.

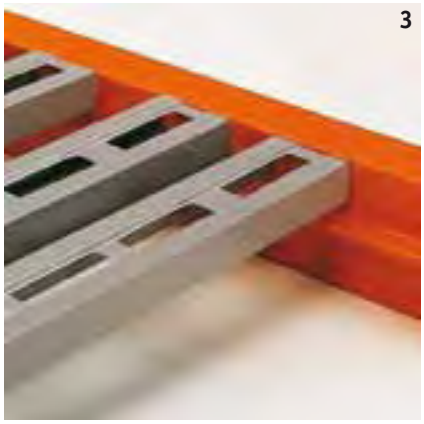




Shelves, unperforated

1. Type N, in galvanized sheet steel; profiled with box-shaped leading edges.

2. Chipboard, in thicknesses of 22, 28 and 38 mm thickness, with melamine finish if required.



Shelves, perforated

(allow ingress of sprinkler water)

3. Type Omega, in galvanized sheet steel; this design provides considerable strength. *Patents: EP 96.120732.1 and G 296.01819.8*

4. Type KA, in galvanized sheet steel; 50% water-permeable.

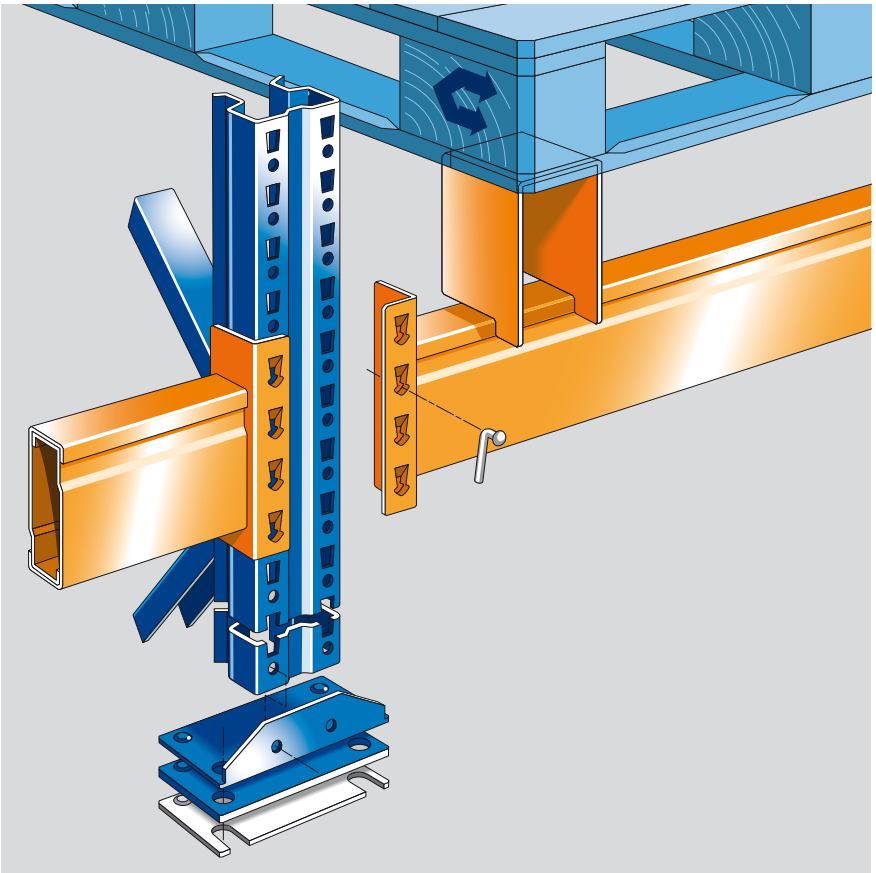
Patent: G 295.12116.5

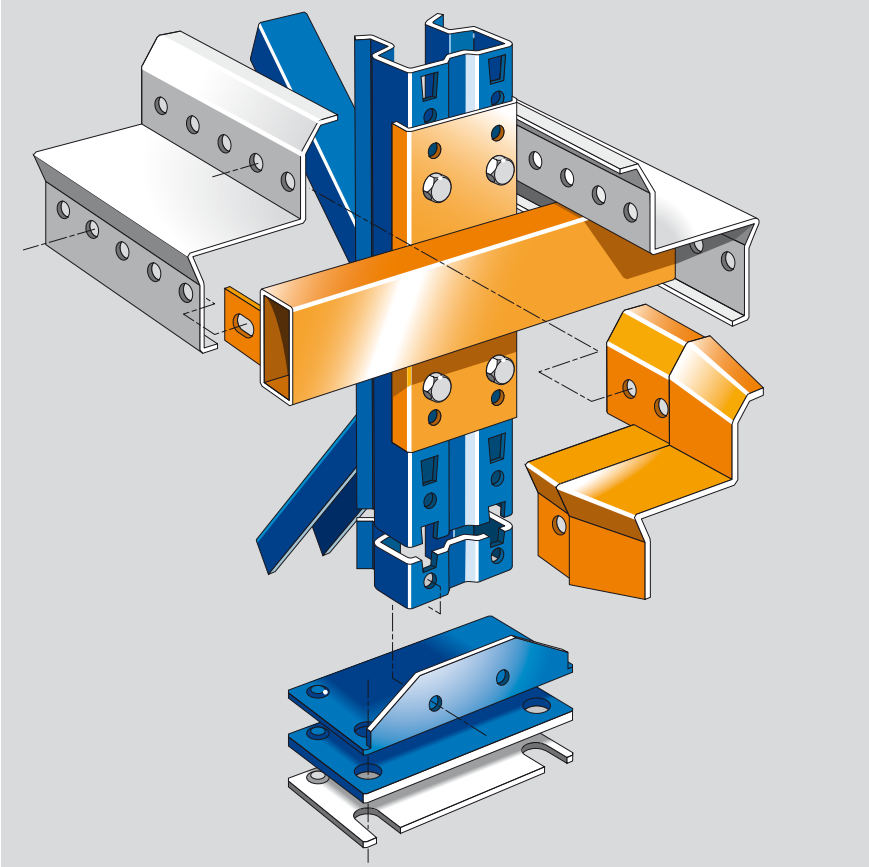
Support consoles

Sufficient space is required under the pallet when containers or pallets with perimeter boarded bottom deck are stored by rack-handling equipment with telescopic forks.

An economical and safe storage solution is provided by welding four support consoles to the beams for each pallet position. The design of these support consoles ensures great stability in both length and depth and can also be fitted with push-through protection.

Patent: EP 98.10.2251.0 pending

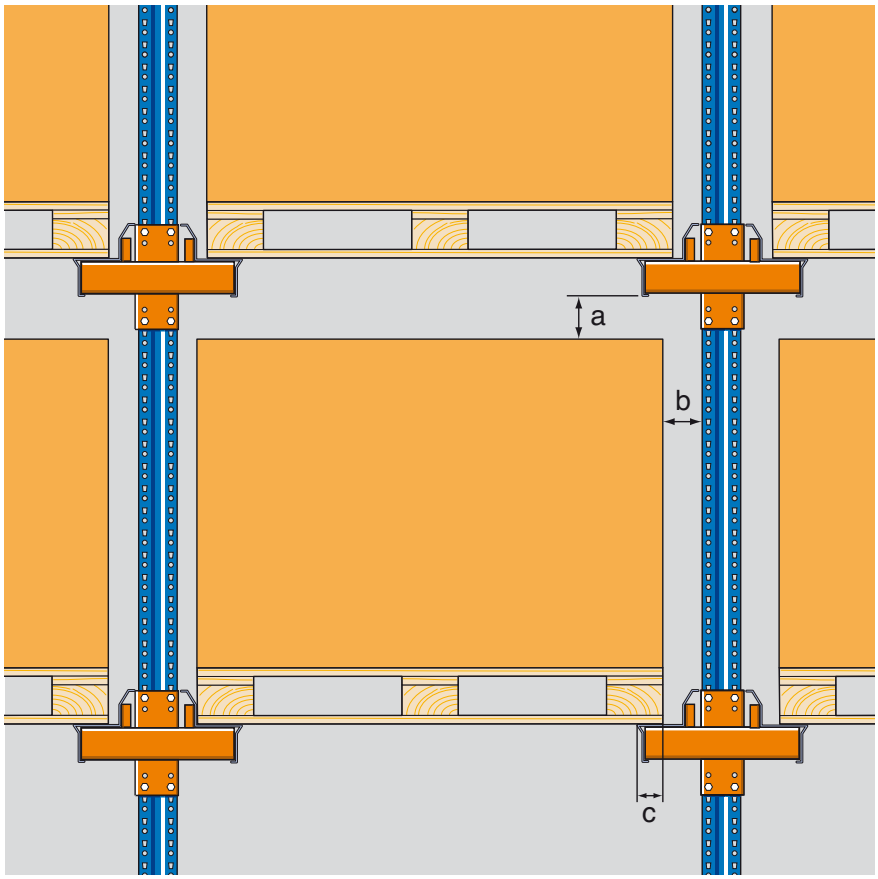




Drive-in pallet racking

Drive-in pallet racks provide a solution when block stacking is not possible because of the fragility of goods. With minimum space loss in aisles, large quantities of similar products can be stored compactly in the channels of the drive-in pallet racks; last-in / first-out.

With upright widths up to 140 mm, Nedcon is able to construct very tall racks, which are hardly affected by deformation due to sideways bending of the uprights. The beams can be adjusted in height every 25 mm. The vertical part performs as a help to 'get in lane' before the rack face (eventual minor use of 'side shift'; see FEM 10.2.03).



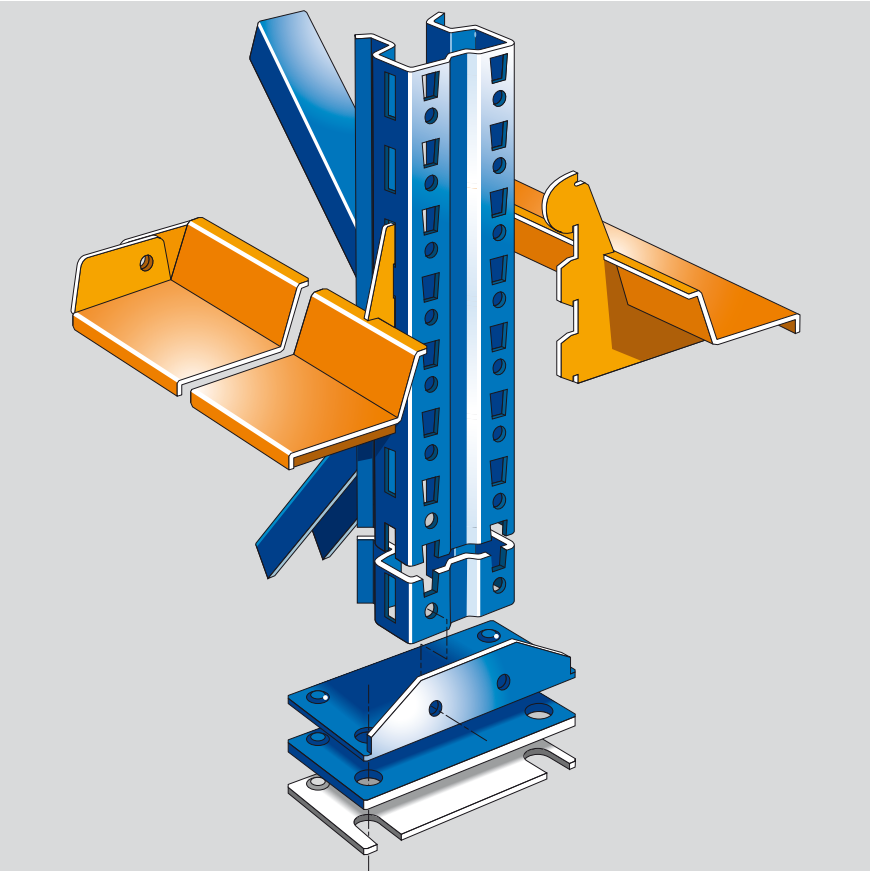
Dimensions

Uprights for a drive-in rack are only connected lengthwise by the top beams, which means the frames along the aisles are liable to bend outwards. When a pallet is positioned against the guide rail on one side, the load-bearing surface on the other side (c) must have sufficient width. Also, sufficient vertical clearance (a) and sideways positioning space (b) must be taken into account, particularly with protruding goods (NEN 5051).).

Protection of the rack construction against collision from a forklift truck is vital for working safety and the durability of the installation.
When the stores are in use, repairs are difficult to carry out, and thus very expensive.
The most important protection provisions are:

- pallet guides for the floor positions
- entry guides on the beam profiles
- upright protectors with impact-deflecting profile

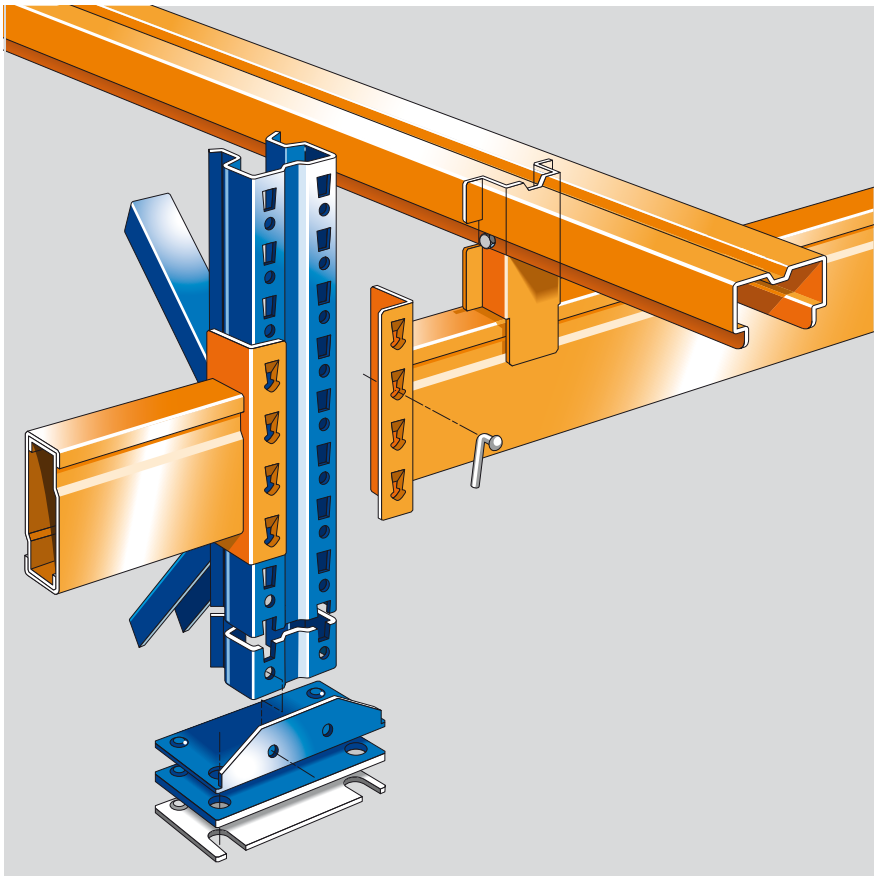
Nedcon drive-in pallet racks are suitable for cold stores. There is no risk of cold-brittleness due to the use of micro-alloyed steel and riveted or bolted joints.



Box pallets and containers, which stand on four corner supports cannot be stored sufficiently safely in a standard pallet rack. In order to be able to do this safely, Nedcon uses pallet racks with hook-in depth beams. This method can also be used when 800 mm deep Euro-pallets are stacked for order-picking.

System characteristics:

- the welded hook-in consoles effectively reinforce the depth beam profile at the four corners of each pallet position.
- the beams can be adjusted in height in 50 mm increments.
- height loss is reduced to a minimum.
- the depth beams have push-through protection.



Double-deep pallet racking saves space, as fewer aisles are required.
The rack-handling equipment must, however, have sufficient handling capacity.

Usually, rack-handling equipment with telescopic forks is used, which require extra space under the pallet. This is achieved by supporting the pallets on front to back supports, which in turn are fixed to consoles mounted on the beams.

System characteristics:

- double-deep storage is achieved without doubling the number of upright frames and bearing beams, ensuring economical construction
- the consoles, which can be welded to the bearing beams, are available in any height
- the pallet supports cover the consoles and are locked on one side with a bolt connection
- this construction can be quickly and safely assembled, even for great heights.

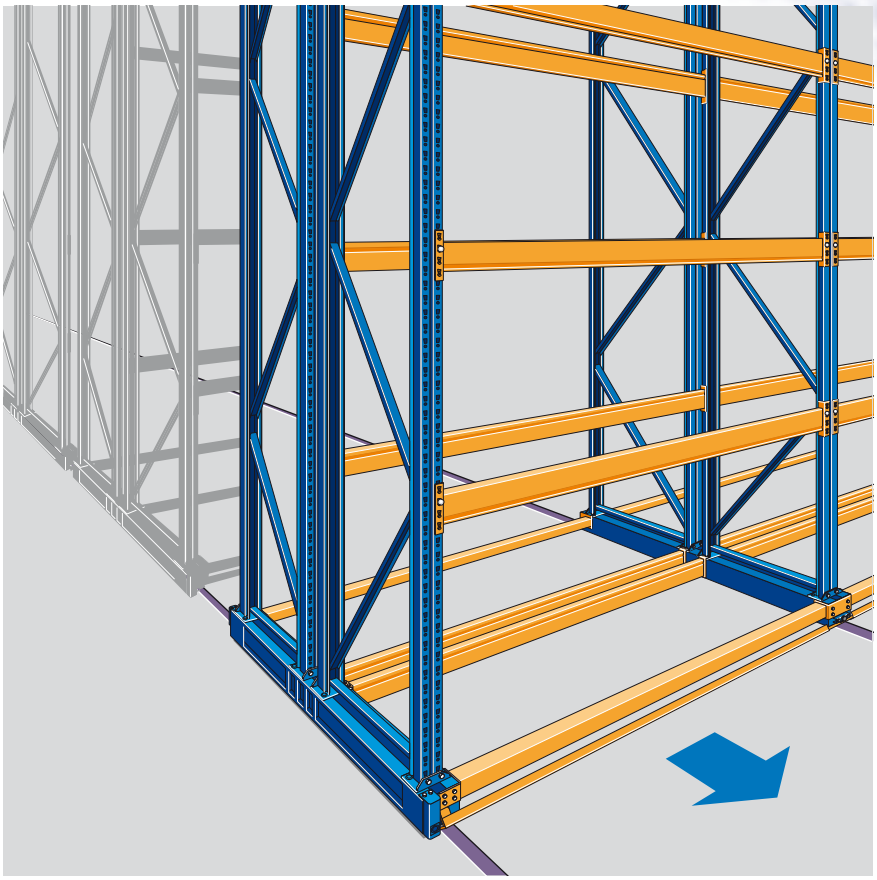
Patent: EP 98.102252.8

4

Mobile pallet racking save considerable space as the number of aisles can be reduced to a minimum.

Another advantage of this type of storage is that each pallet remains directly accessible. Mobile pallet racks are often used where storage space is expensive, in freezer and cold stores, for example.

Each rack row is mounted on a mobile baseframe, drive and control maintenance has been reduced to a minimum. The construction height of the baseframe is limited to 245 mm. Wheels and axles are manufactured from special high-quality steel, suitable for very high loads: 12 or 18 tons per wheel as standard.
The number of motors staggered in the baseframes ensures that the drive is distrubuted evenly, even over longer lengths.



System with two aisles, used in combination with VNA-truck.
Aisle length: 37 metres, with sprinkler system incorporated.

Safety fittings

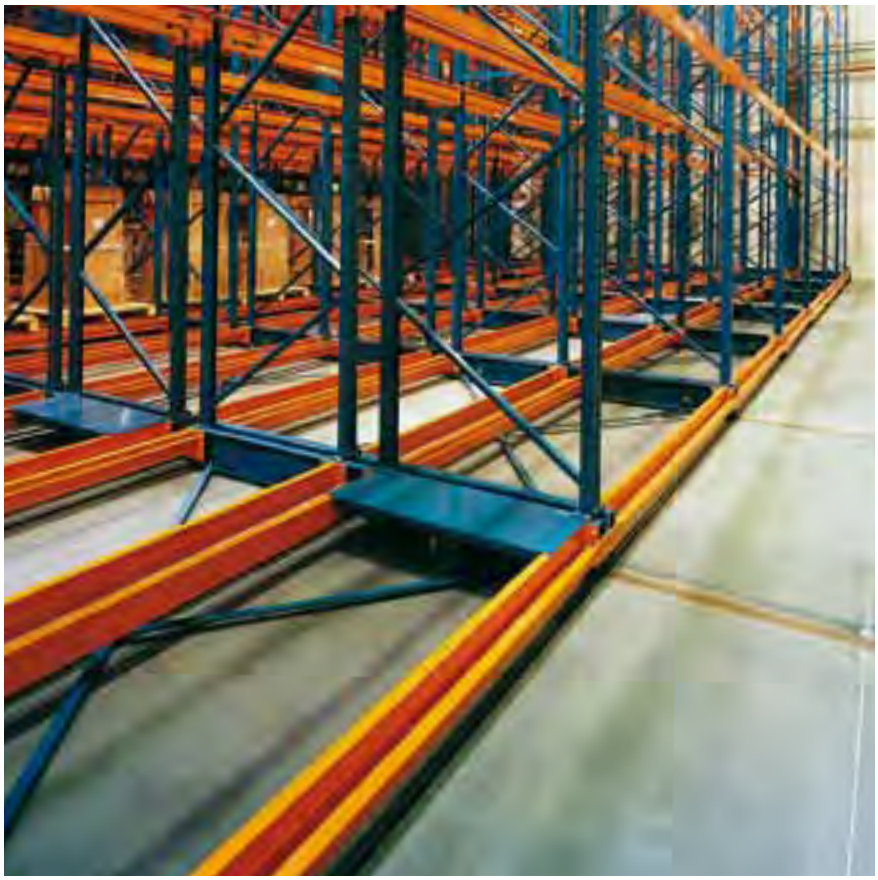
There are safety guards fitted on both sides of each baseframe. The rack is stopped as soon as there is the slightest contact with the guard.
An infrared safety system can be used instead of these mechanical guards.

Remote control

Aisle selection using remote control saves waiting time. This is of great practical use in cold stores, allowing operation from closed forklift trucks.

Night position

For use in cold stores, the control system can include a “night” position. With this, the rack rows are separated, so that all the goods are properly cooled.



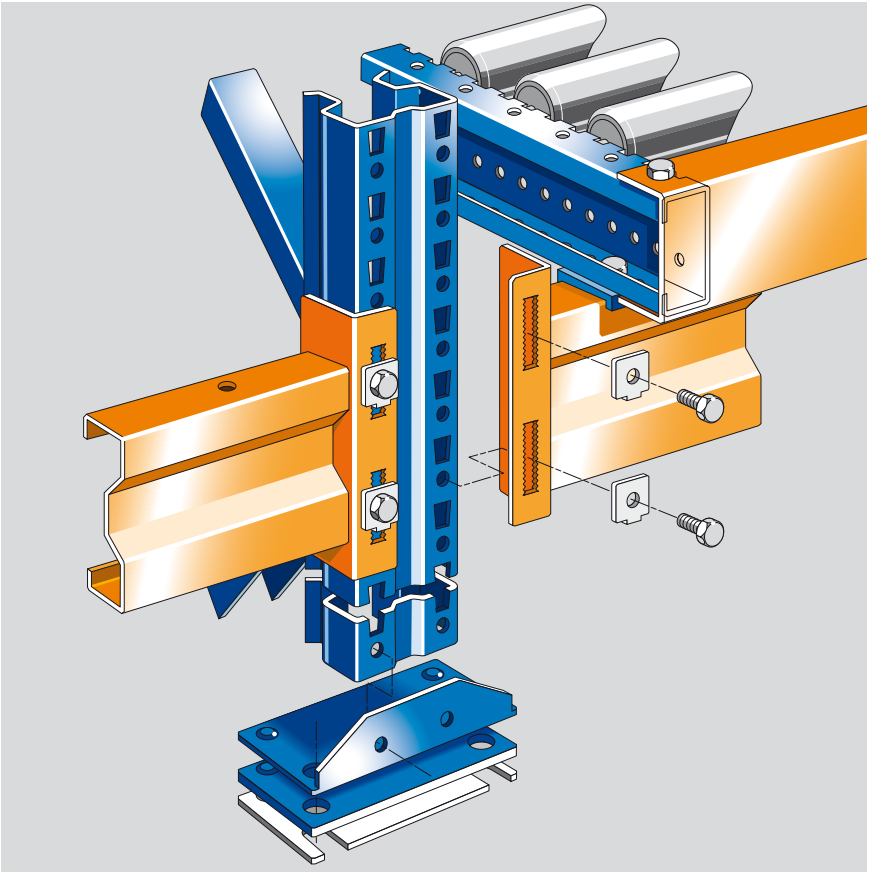
Mobile racks for narrow aisle trucks

The use of induction-guided trucks between mobile racks requires extra fittings. The racks have guide profiles for the truck side guide wheels. Mobile rack control can incorporate a fine-positioning system, so that the racks can be accurately positioned over the whole length of the aisle in relation to the induction wire in the floor.
The induction wires in the floor cross the rack rails.

The pallet racks shown have a sprinkler installation with hinged pipe elements.

5

The **guide flange wheel system** is the most common method of guiding mobile pallet racks. With long, double rows and high wheel loads, exceptionally high friction forces can be generated between rails and guide flanges, with a risk of de-railing. This can impose such forces on the baseframe that serious damage could be caused to the system. Using guide flange wheel systems demands considerable precision in laying the parallel guide rails and a very flat floor.



Live storage systems provide a compact storage method, combined with the first-in / first-out principle. The pallets roll down a sloping roller track under the influence of gravity from the loading face to the picking face.
A gradient of 4% is usual, and this can be achieved using standard hook-in beams.

When damp wooden pallets, or pallets with differing weights are to be stored in the racking, extra measures are required, such as brake rollers, a different gradient, or a modified roller distance.

There is a Nedcon connector available, which allows the gradient to be infinitely adjusted. This connector will withstand very high loads and makes it possible to rearrange the rack construction for new or different product groups.
Patent: EP 87.2012443.0
USA Patent: 4,815,613.

Steel load-bearing rollers

These special Nedcon load-bearing rollers incorporate a full-width axle with a diameter of 12 mm, instead of the usual two separate stub axles.

Load-bearing rollers are available with different types of steel ball bearings with admissible maximum loads of 160 kg and even 240 kg per roller.
The bearings are lubricated and can be used in cold stores. Rollers are available in steel or galvanized and in any length. Standard lengths are 862, 1,062 and 1,262 mm.

System characteristics:

- virtually no angular rotation of the bearings
- the load-bearing rollers can be fitted in the roller track without bolts, when the whole rack has been assembled
- easy removal of the rollers is an advantage when cleaning the floor

Controlling passage speed

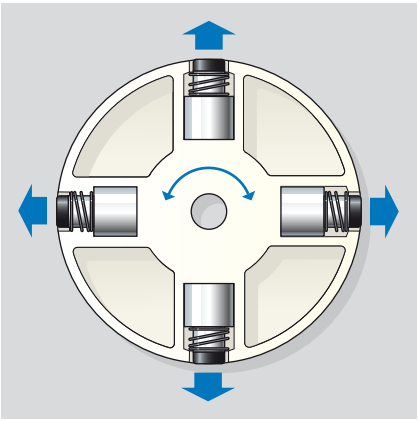
High pallet weights and increased track gradient influence pallet speed, as do long track lengths and pallets with hardwood bottom decks. An increased gradient is usually adopted when variable pallet weights are stored in the same lane.

In order to regulate this speed, retarding devices, or brake rollers, are often used in live storage racking. Brake rollers are also recommended where the pallet loads are unstable.

Brake rollers are available in two types:

- direct brake rollers, with the brake mechanism inside a load-bearing roller with limited diameter. These are not suitable for high pallet weights and high throughputs.
- indirect brake rollers, with a larger diameter, spring-suspended under two load-bearing rollers, providing indirect braking

Indirect brake rollers are recommended as greater contact and, therefore, less chance of the pallet slipping, occurs as two load-bearing rollers are in contact. Further, impact loads on the internal brake mechanism is less than with a direct brake roller, which improves durability. The Nedcon brake roller is constructed with a new brake system, which also allows pallets with widely differing weights to be separated.



Moreover, the system operates with the same effectiveness in both directions of rotation. Therefore, it can also be applied in push-back roller systems.

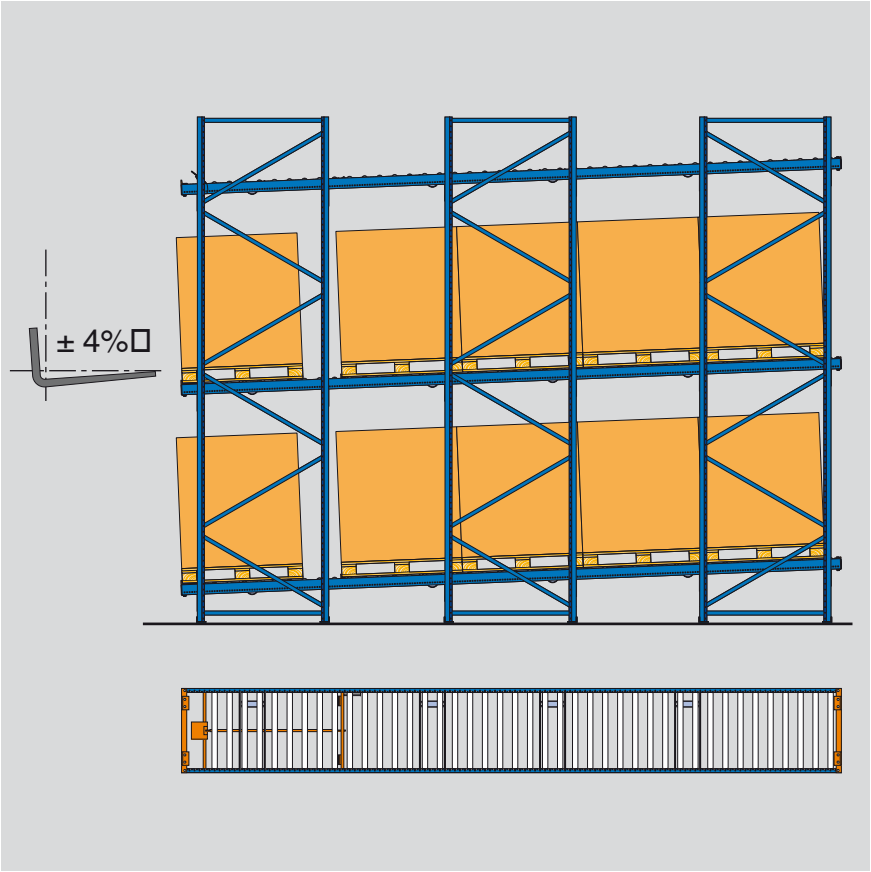
Patent: G 296.21925.8

A **separator** ensures that pallets can be properly picked up on the output side, without being pushed by other pallets. There are a number of types available:

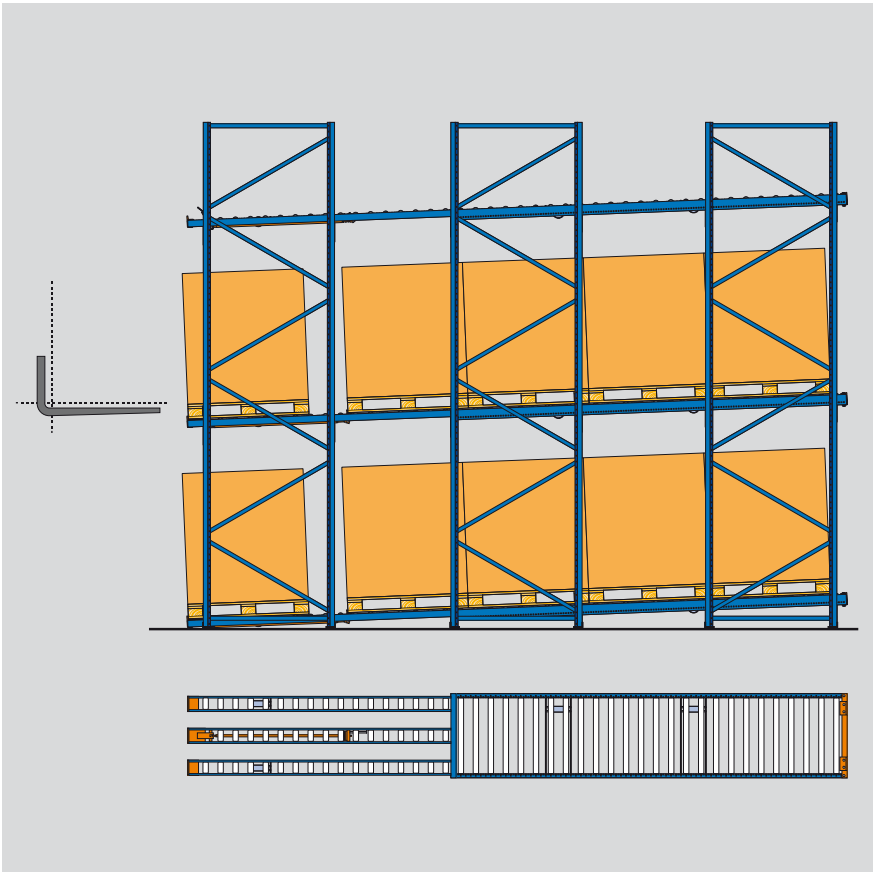
- for shallow racks (two or three pallets deep) with a simple mechanism
- with an interlock for racks where orders are assembled on the picking face
- for deep racks, where considerable line pressure may be a problem

Patents: EP 195.02888.0 and G 94.04684.0

In very deep channels, it is also possible to fit two separators into one channel.



Full-width rollers are often used in roller tracks where stacking and unloading is carried out by forklift trucks. It is possible to lift up and put down the pallets on the slightly sloping roller tracks by tilting the truck mast. There is also automatic rack-handling equipment with adjustable fork dipping.



Narrow-track rollers are used at the loading and /or picking face when handling equipment with fixed-masts is used. These rollers allow clearance for the forks between the rollers.

Guide rollers

When utilizing automated rack-handling equipment, the used positioning system must be taken into account for fault-free unloading. Also, the pallets should be properly centred on the roller tracks in order to move easily from the loading to the picking face.

The roller track profiles are formed in long lengths in one piece and perforated under computer control. The fitting of horizontal bracing ensures that the rollers are aligned precisely at right angles to the direction required.
When roller tracks are very long and the rack stacking system does not have a fine positioning system, side guide rollers can be fitted. This method is preferable to the use of flange guide rollers, due to the low frictional resistance.
Patent: G DE 295.11890.3 - AT 1079

Floor tracks can be constructed with narrow-track rollers making it possible to take out pallets using a manual pallet truck. Because of the track slope, the pallet truck must have sufficient lifting hight. In this situation protection against impact damage should be considered.

When the first pallet is removed, any other pallet will automatically also move. A foot release mechanism is available to control the movement of these pallets which is an important safety feature.

When electric pallet trucks or manual pallet trucks do not have the necessary lift height, the front off-load position can be fitted with a heavy-duty steel plate. This plate is fixed to the floor between the tracks at the same gradient as the roller tracks.

Pallet live storage with narrow-track rollers

Narrow-track rollers with short load-bearing rollers are used in:

- cross-track transport of Euro-pallets
- automated rack-handling equipment with telescopic forks
- pallets with perimeter boarded bottom deck

Characteristics of the Nedcon narrow-track rollers, which can be profiled in any length, are:

- profile width: 130 mm
- roller width: 100 mm
- roller diameter: 40 mm
- distance between centres: 50 mm
- profile pitch (adjustable): 25 mm
- load per roller: 160 kg

Assembly is done by means of a click connection with spring axles.

Brake rollers can be built into the narrow-track rollers to control pallet speed, so roller tracks of greater lengths can be used. A simple ramp stop can be fitted at the picking side.

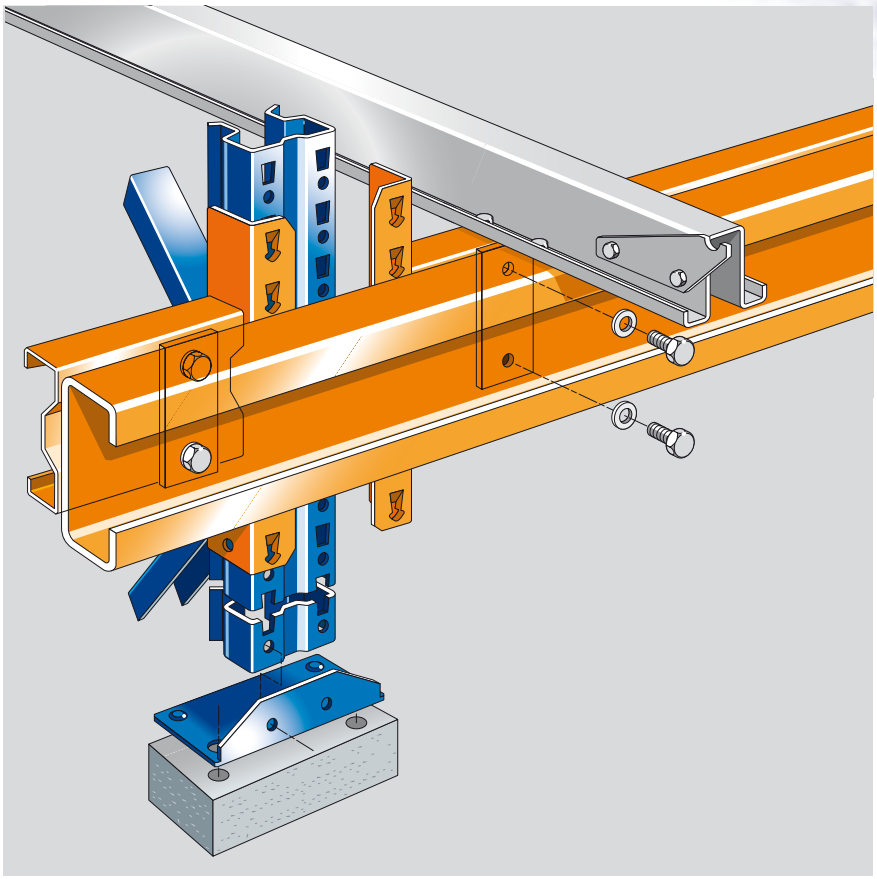
Push-back protection can be fitted in the track to prevent pallets protruding into the rack operating aisles.

Separators can be built in, which can also be fitted with a foot release.

Multi-tier pallet live storage using narrow-track rollers, as used in order-picking systems, can be fitted with mesh panels to provide accidental fall protection.

The three-track order-picking system shown, is used in conjunction with a pallet-handling crane fitted with telescopic forks. The tracks are fitted with push-back protection, a brake roller and a foot-operated separator.

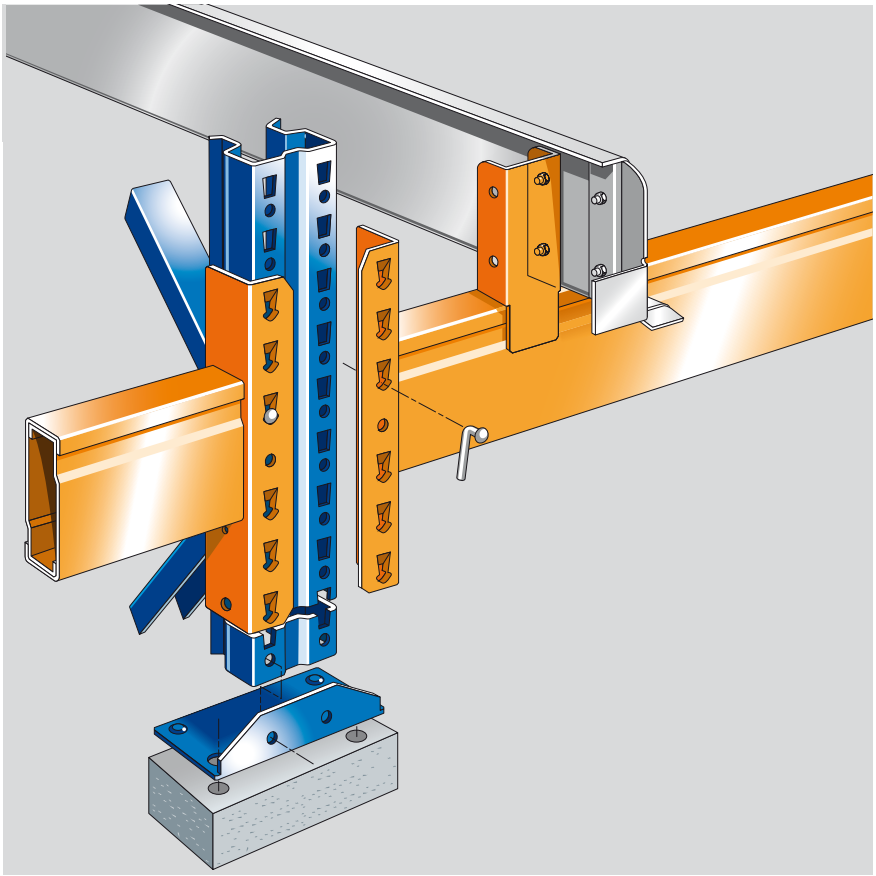
Interlocking roll pallet racking is a system for automated, compact storage of goods on roller pallets. With this system, coupled roller pallets form a train in each of the deep rack channels.



Nedcon has developed special, heavy-duty rail profiles for the trolleys, profiles for the roller pallets, consoles and backstops.

Nedcon has built installations for high and low loads up to 25 metres high, also in roof and wall-bearing constructions.

The installation shown below has a total storage capacity of 100,000 pallets and a turnover of 12,000 roller pallets per day. Each channel can take a maximum of 44 interlocked pallets.



Racking for satellite technology

The handling crane is fitted with a satellite (pallet carrier) with which the pallet can be inserted or removed from deep channels.

This rack structure must be able to withstand the static load of pallets with goods, but also accommodate the dynamic loads created by the satellite. In high turnover operations, several satellites can be operating above each other in the same aisle.

In such a situation, the depth beams serve as supports for the pallets and as rails for the satellite. Nedcon's experience and modern technology enables us to meet the specific demands of our system partners in the manufacture of these custom-made profiles.

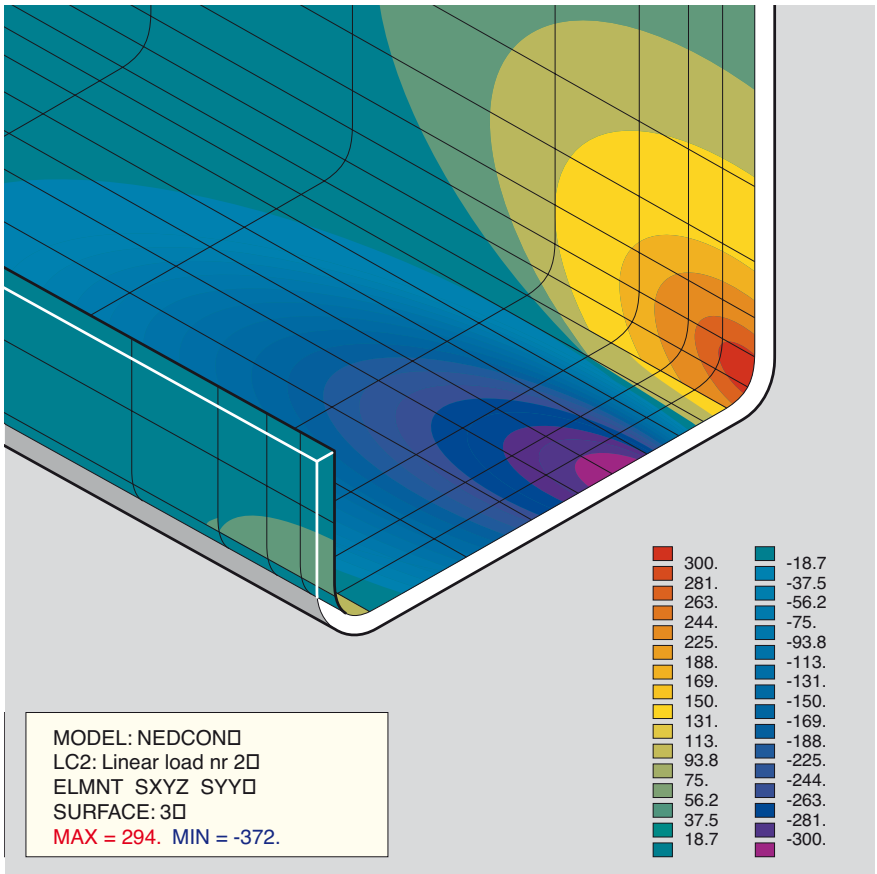
Loss of storage space can occur when bracing systems are required. By using heavy-duty hook-in connectors loss of space is minimised.

Construction - points of interest

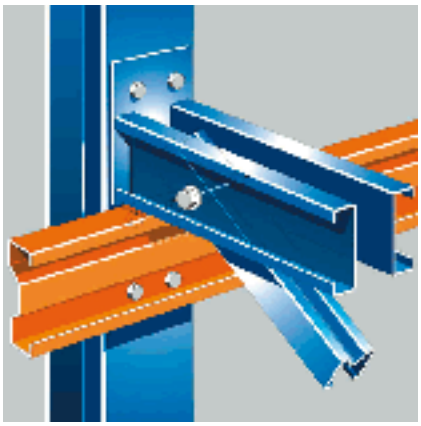
The design of the satellite rail can be specifically adapted to accommodate the equipment used by our system partners.

Special consoles, welded to the load-bearing beams, are used for connecting the satellite rail on the load-bearing beams. This prevents the wheel tracks from resting on the load-bearing beams and reduces the torsion of the satellite rails over the whole length.

Patent: G 298.02224.9



The wheel contact area is inevitably subject to bending loads. Crack formation can occur at the corner due to metal fatigue and peak loads. Independent research and many years of experience enable Nedcon to determine the exact size, shape and type of steel required for these profiles.



Clad rack constructions for pallets

The construction of this type of pallet racking is more complex than that of standards systems. Additional forces due to outside elements such as wind and snow result in extra tension and pressure forces which have to be taken into account.

For structures of this type, up to a height of 30 metres, colled-rolled upright profiles can be used. A combination of hot and cold rolled profiles allow the construction of even higher structures.

In order to prevent possible deformation caused by wind forces the construction of single-deep high rise systems is different from a similar low bay construction.

Nedcon has developed a completely new constructional design for heavy-duty and very high silo constructions. This special knock-down system has clear practical advantages over other systems as it saves freight costs and takes up less space.

Assembly costs are reduced because of the simple connections between beams and diagonals. Fixing the beam profiles under the frame horizontals ensures reduced eccentricity at the assembly points and enables easy fitting of sprinkler systems and push-trough protection.

Patent: EP 98.109721.5

Constructional design

In order to create a reliable design, we always draw a detailed strain model of the silo with the exact properties of profiles and joints and run it through a special calculation programme. By means of a special computer programme, based on finite element methods, which also take into account second order effects, we calculate combinations of wind loads, stored goods, earthquakes and assembly imperfections, as described in the building standards.

The results give an accurate picture of the strains and deformation, which can occur in the structure and the compression and tensile forces imposed on the concrete foundations.

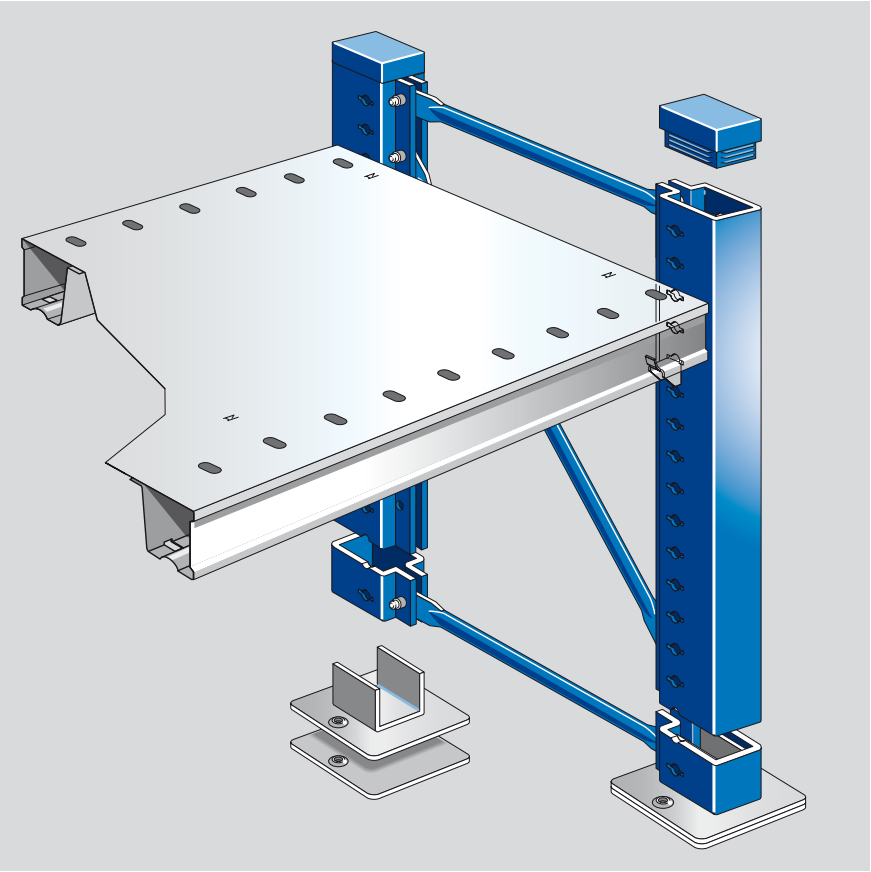
In this way Nedcon can check that the design conforms to the national standards for building constructions.

NEDCON®
advanced storage technology

Solution-focused by nature

Storage systems for small parts

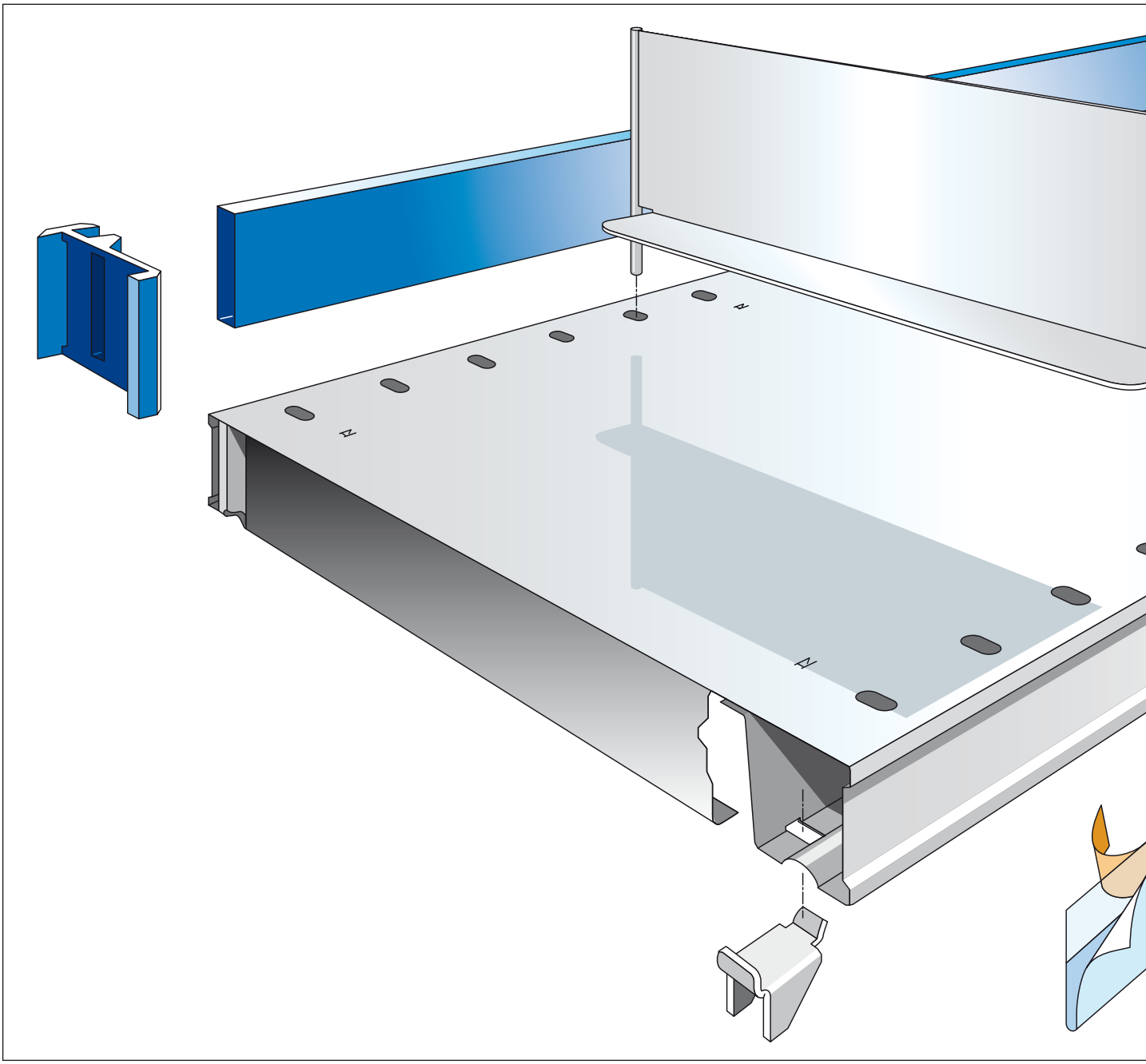
Advanced storage technology

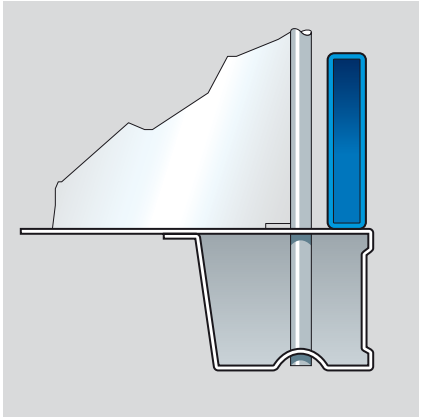


Shelving is available in many configurations in either low or high bay, and in multi-tier or mobile systems, for general storage or archive situations. The system is easily adjustable in height in increments of 25 mm and has many accessories to enhance the storage possibilities.

With frame load bearing capacity up to 10,000 kg and installation heights from 2 to 25 metres Nedcon's range of upright profiles allows complete custom-made solutions possible. Uprights are available in one piece up to 14,4 metres long and therefore limits the need for splices.

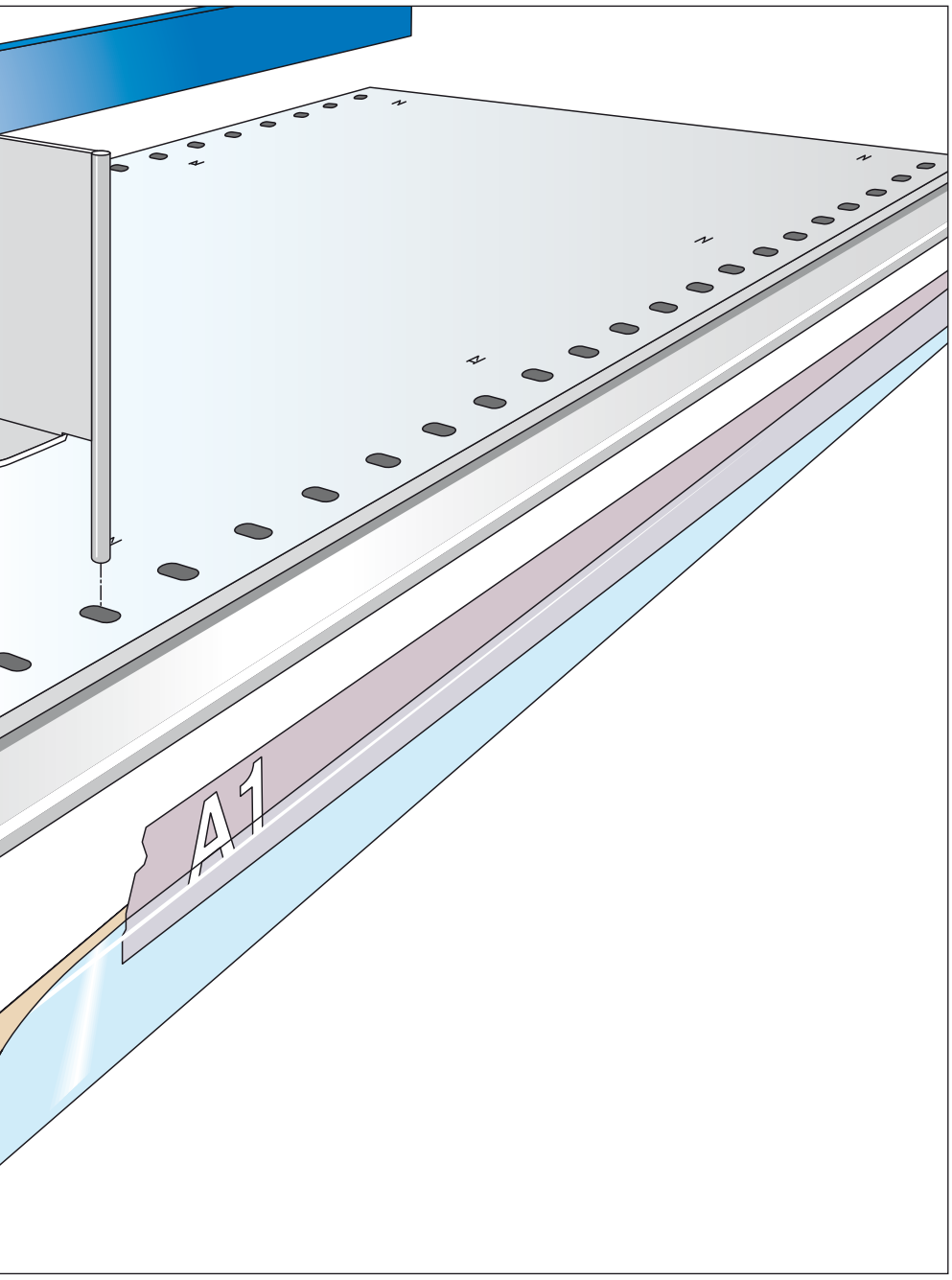
Nedcon **shelves** are available with load-bearing capacities till 600 kg, sendzimir galvanized (impact-resistant powder coat finish on demand).
The shelves are produced in a range of lengths. Nedcon shelving is also ideal for high, crane-operated installations, or for high-rise construction in combination with mezzanine floor systems.





Detail of shelf and divider. The rounded edge of the divider does not protrude below the shelf.

The front plinth also has rounded corners and can be easily fitted with plastic clips.



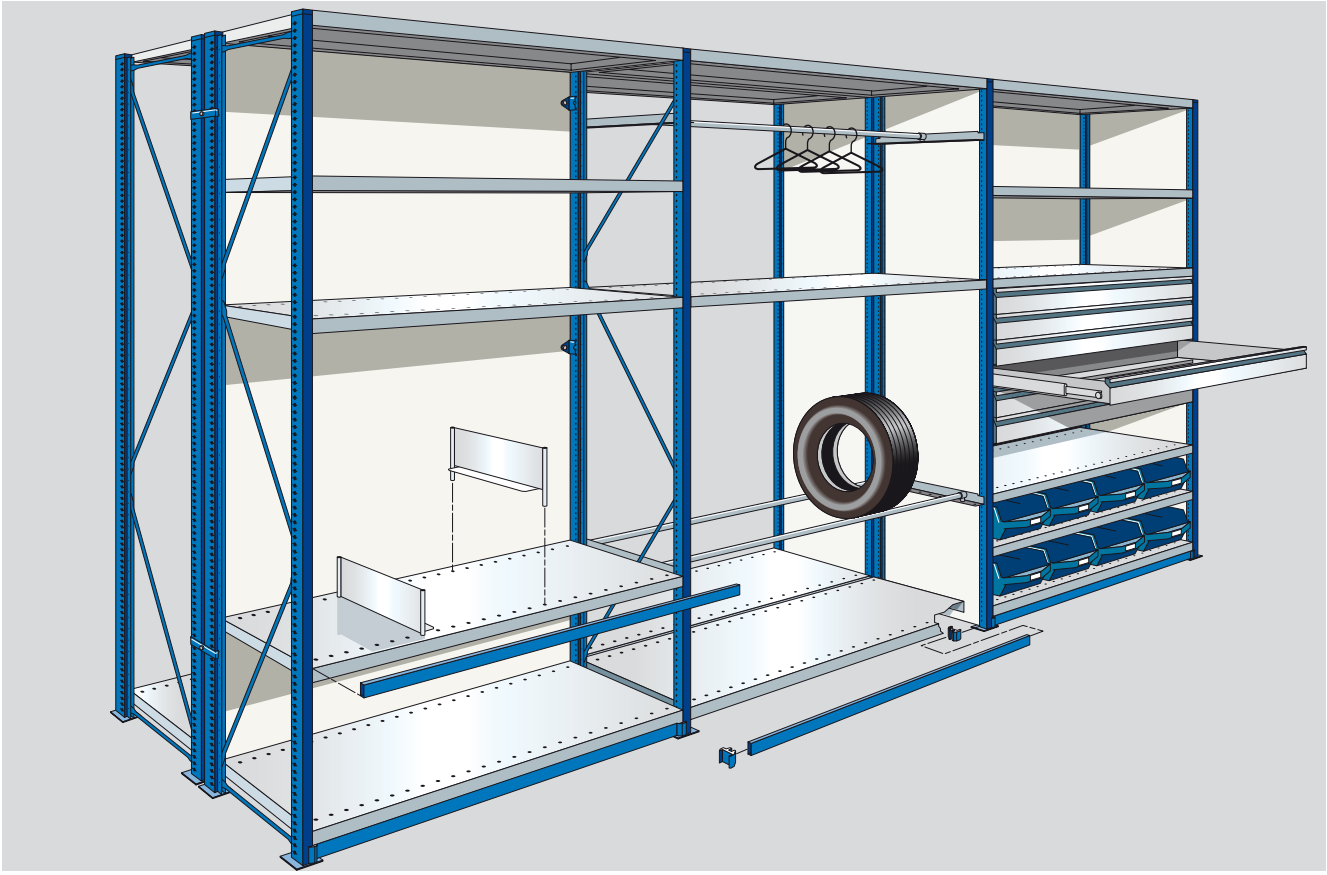
Nedcon shelf – characteristics:

- the box-shaped edges will not twist under load, have no sharp edges and are very strong and stiff, due to the profile dimensions and shape
- the short sides are double folded and form a 40 mm high U-profile, which assures all round strength
- the front profile is purpose formed to support magnetic labels and is ideal for fixing all other forms of location labels
- the double material thickness, where the shelves fit on the clips, increases resistance against impact loads

The unique design and construction of the Nedcon shelf gives greater load bearing capacity and less edge bending than traditional shelves.

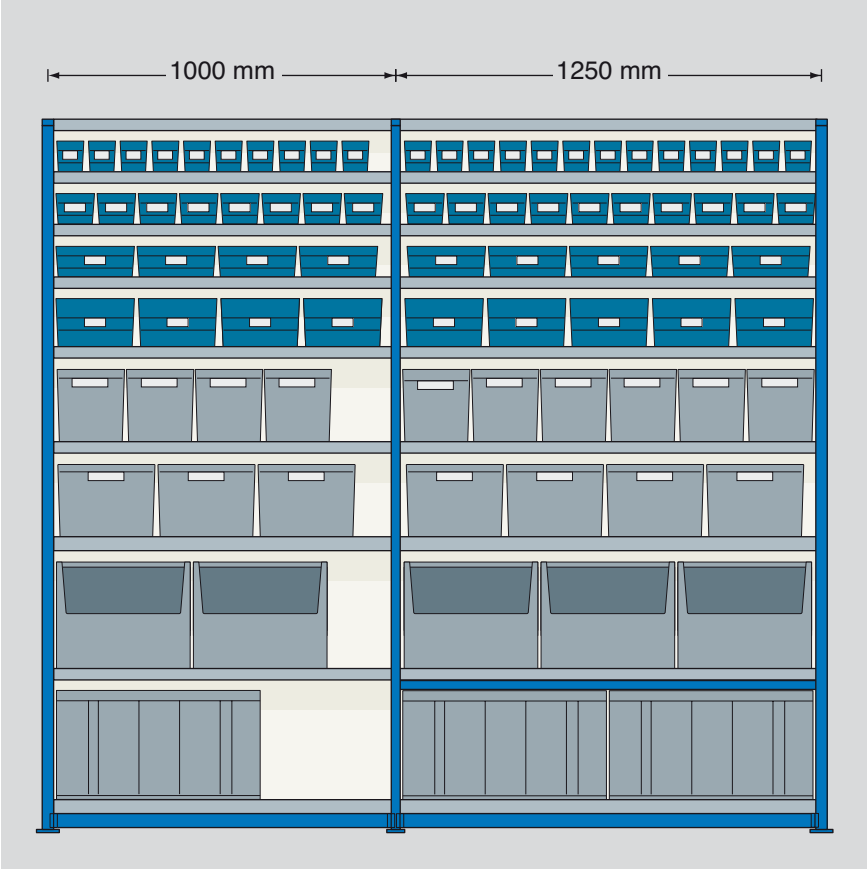
The location indicators are protected by transparent, self-adhesive label holders and are easy to replace or move.

Shelves are sometimes used to stand on. The strong box-section front increases the resitance to this improper loading.



The following supplements are available:

- floor plinths
- front plinths
- dividers with rounded front, which fit in the shelf perforations
- rails for hanging files
- tyre supports
- clothing rods
- steel drawers, with dividers, can be pulled out 100% on telescopic guides
- back and side panels in various materials.

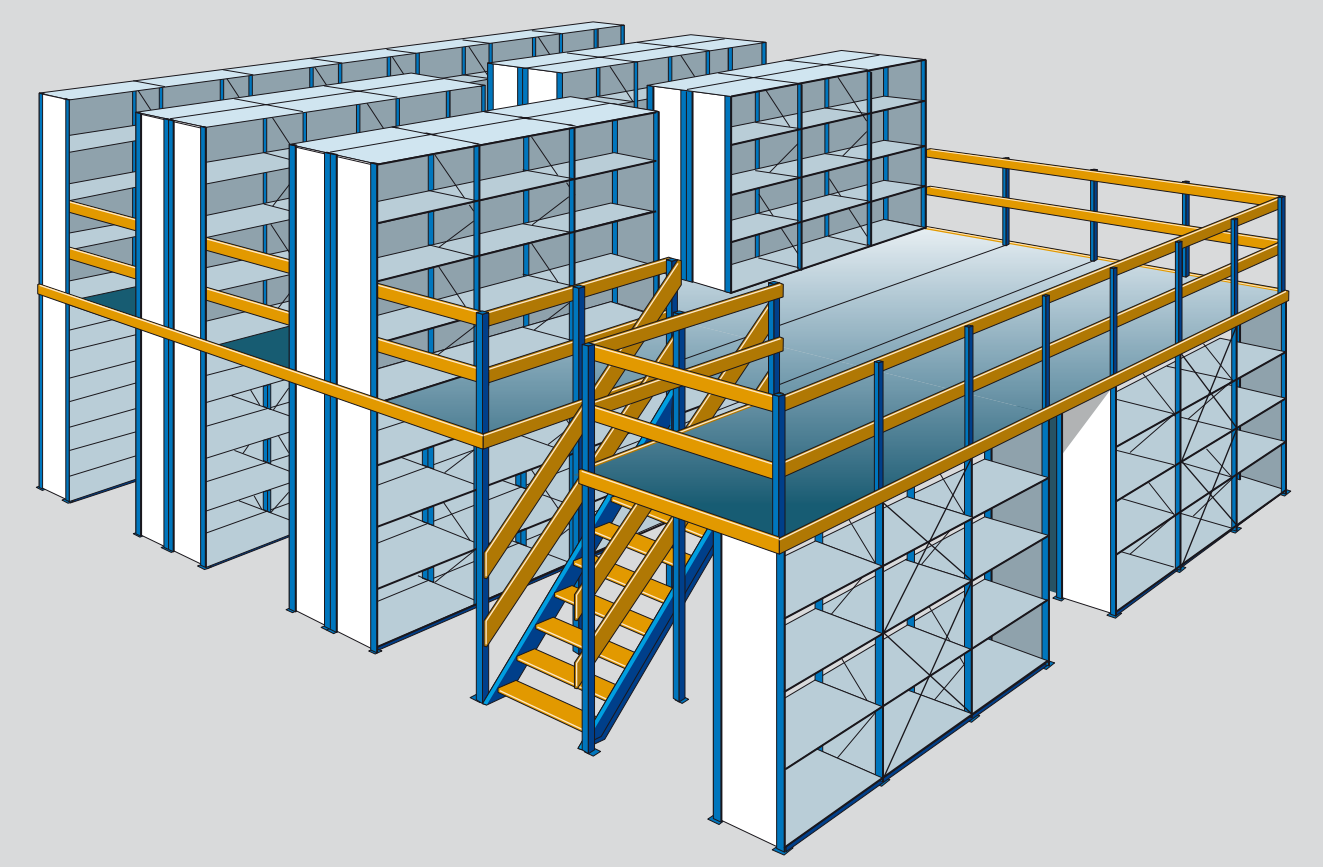


Bay dimensions

The most common bay length for shelving used to be 1,000 mm. These days, the dimensions of plastic containers and cardboard packaging are increasingly related to the Euro-pallet dimensions (1,200 x 800 mm).
So standard containers and cartons with lengths and widths of 200, 300, 400 and 600 mm fit into 1,250 mm racks without any wasted space. This also applies to the plastic containers shown.

Other bay dimensions are also possible for goods with different dimensions.
The maximum bay length with perforated shelving is 1,500 mm, while unperforated shelves can be manufactured in greater lengths, as required.

Plastic containers with dividers and labels for shelf depths of 300, 400 and 500 mm; colour is blue, identical to the upright frames.
Widths: 90, 118 and 236 mm. Heights: 90 and 150 mm.

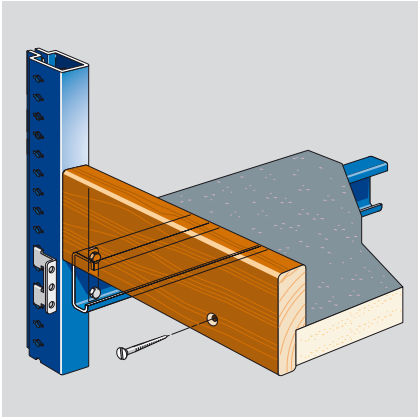


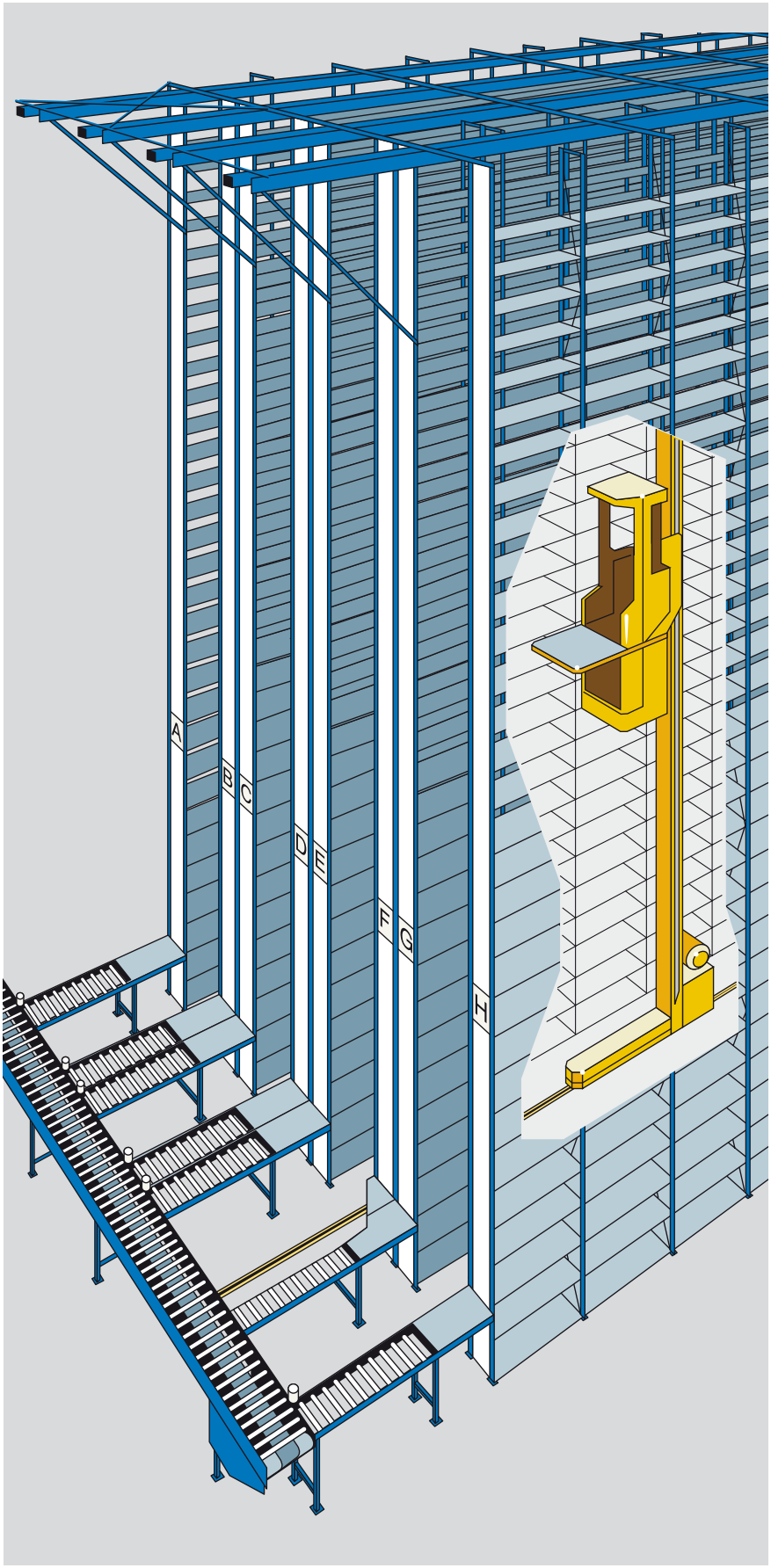
Multi-tier construction can be stack-constructed with separate overall floors, or with continuous uprights and intermediate floors.

Floors can be either solid panels or open grating. Panel floors are more common as operating noise can be reduced, pallet trucks can be used and there is no risk of dust or other debris falling through.

Panel floors are available in different strength qualities (bending strength from 10 to 22 N/mm^2) and in various thicknesses (28 to 60 mm). Nedcon has developed a heavy-duty floor panel with sandwich construction, which withstands very high concentrated wheel loads from electric pallet trucks.

Floor panels are fitted together with tongue-and-groove joints, where the joint is not supported by the steel construction. The panel surface can be finished with a decorative wear-resistant layer (abrasion-resistance class S1, in accordance with DIN 68765-1987).
The underside of the panels can be finished with a white melamine layer for light reflection.





High-rise shelving racks are serviced by cranes and are characterised by the stringent requirements laid down for tolerances and stability.

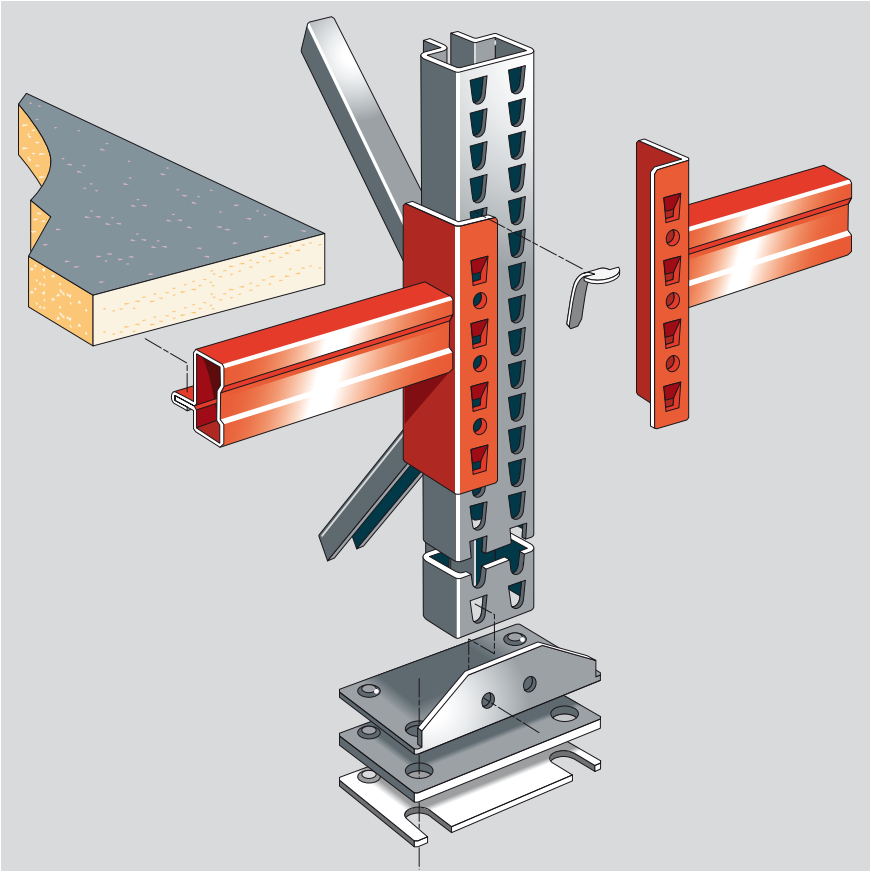
Perfectly vertical positioning, levelling, anchoring and grouting are vital in automated systems for accurate crane positioning.

With high, shallow depth racks the load-bearing capacity of the frames plays an even more important roll due to the frame slenderness.

Upright profiles must be perforated over their whole length with exceptional precision.

Precision assembly of the top guide rails is essential for vibration-free operation. Any sprinkler system must be incorporated in the design.

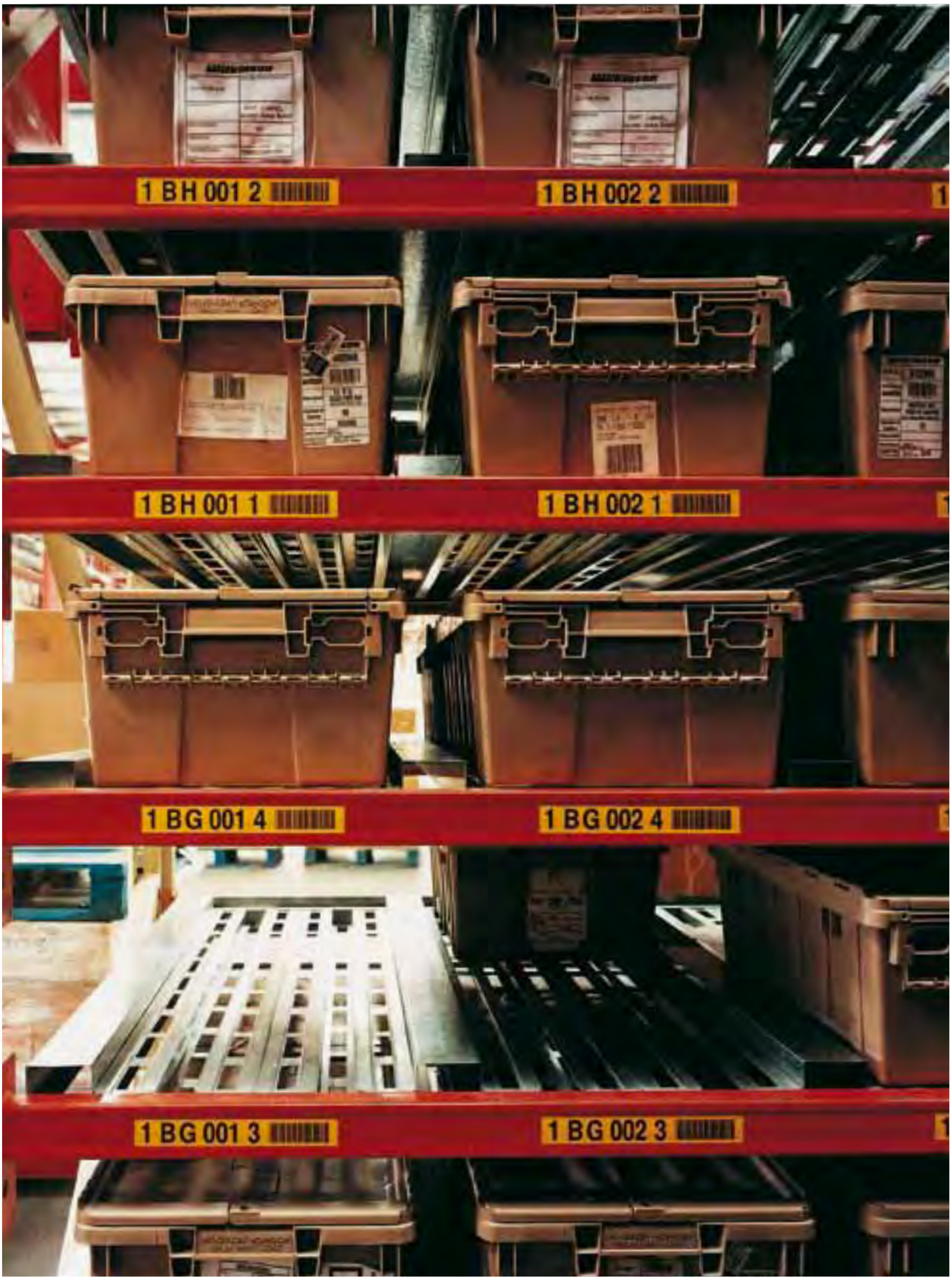
Nedcon has considerable knowledge and experience of this type of high shelving construction.

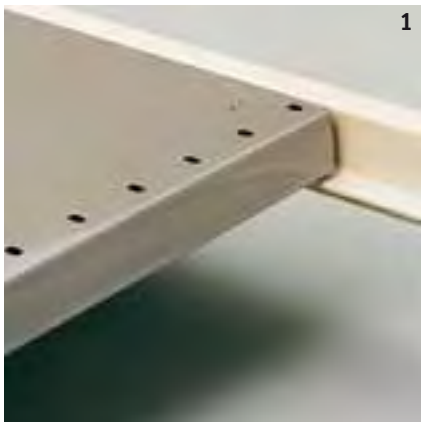


Wide-span shelving are constructively similar to light pallet racks. The slim beams with box section profile are torsion-free and shaped to take the recessed shelves between the beams.

The shelves can be adjusted every 50 mm (as a standard) or 25 mm, depending on the system perforations.

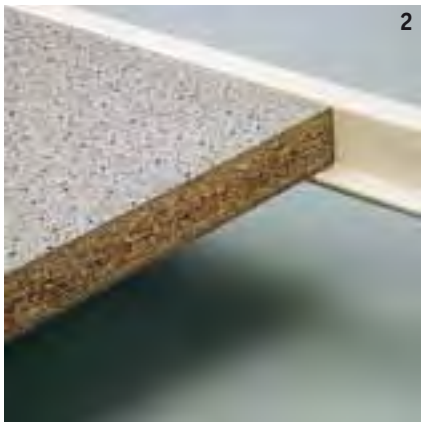
The bay length can be chosen in a range of sizes to a maximum of 3,000 mm. This means that a robust racking system can still be economical.


1 BH 001 2
1 BH 002 2
1 BH 001 1
1 BH 002 1
1 BG 001 4
1 BG 002 4
1 BG 001 3
1 BG 002 3


1

Shelves, unperforated

1. Type N, in galvanized sheet steel; profiles with box-shaped leading edges.


2

2. Chipboard types, in thicknesses of 28 and 38 mm with melamine finish if required.


3

Shelves, perforated

(allow ingress of sprinkler water)

3. Omega type, in galvanized sheet steel, the design provides considerable strength. *Patents:*
EP 96.120732.1 and G 296.01819.8


4

4. Type KA, in galvanized sheet steel, 50% water-permeable.
Patent: G 295.12116.5

Multi-tier construction for wide-span shelving is possible due to Nedcon's ability to manufacture hook-in connectors and upright profiles in the sizes required for constructions of this type. This illustration shows an installation with four levels.

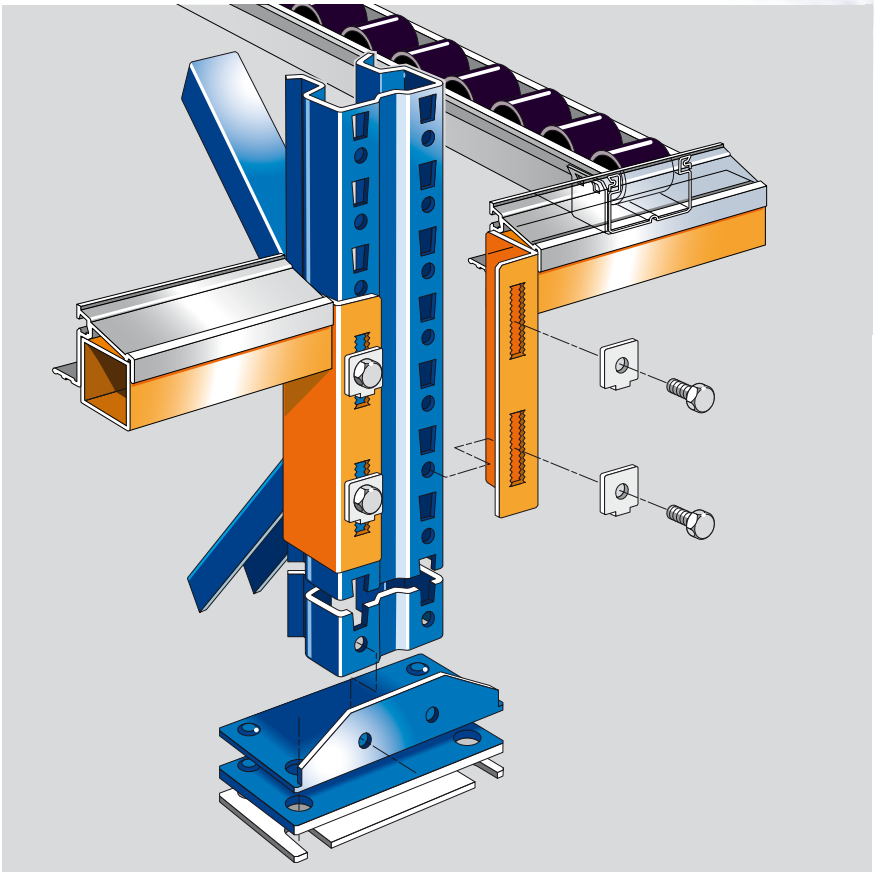
Carton live storage

Live storage systems are ideal for efficient order-picking. The goods move under gravity along a slightly sloping roller track, from the loading to the picking face.

There are a lot of easily accessible locations on the picking side, with a buffer stock of the same article behind each pick-location.

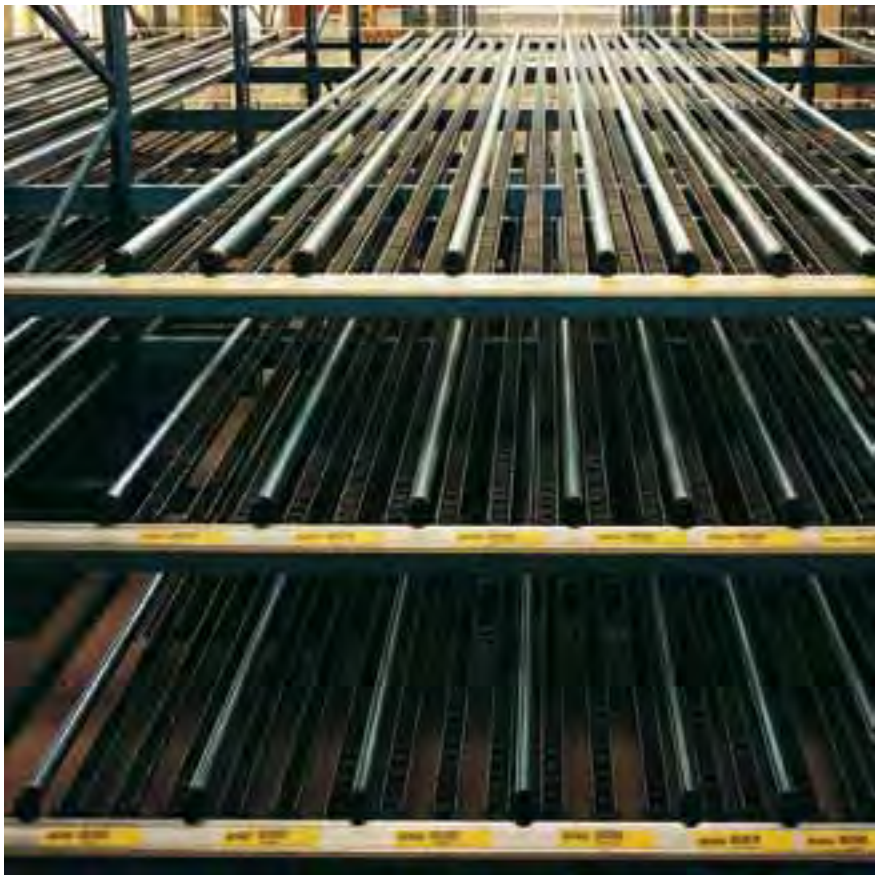
Characteristics:

- compact picking area
- clearer indentification
- first-in / first-out principle
- no empty pick locations



With the fully, easily **adjustable gradient**, the speed of the goods can be very accurately controlled. With longer tracks the goods could move too fast. Also, poor packaging could cause jamming of goods.
Nedcon has developed a beam–to-upright connector to allow infinite adjustment of the right gradient for a very wide range of product groups.
Patent: EP 87.201243.0
US Patent: 4,815,613

This connector can accommodate very heavy loads, has high rotation strength and stiffness, even allowing multi-tier construction. As with many other Nedcon systems, the main construction consists of upright frames and load-bearing beams, making other system combinations possible.



Narrow-track rollers are used in a number of combinations, determined by the quality and weight of the carton being stored, thus assuring the functionality of the system. Nedcon's own roller tracks are fitted with high quality rollers and steel axles, which gives enormous strength compared to rollers with plastic axles.

For heavy boxes and crates, and when used intensively, in the Food- and Retail sector, for example, stronger roller tracks are necessary. To meet this requirement Nedcon has developed heavy-duty narrow-track rollers with a **profile width of 55 mm**. These have almost three times the profile strength and stiffness. The 40 mm wide plastic rollers are extra impact-resistant and have 4 mm diameter steel axles.

The load-bearing beams for carton live storage racking have aluminium profiles for fitting the narrow-track rollers and separation brackets. These also allow easy readable labels to be fitted.
Patent: G 93.03527.6

Retaining clips

Track retaining clips manufactured in both spring-steel and plastic are available for both types of track.
Model: plastic or spring-steel.

Brake clips

Even with finitely adjusted tracks it is possible for some goods to travel too fast. By fitting brake clips the speed can be controlled.

Lane separation

If lane separation is required Nedcon can supply a standard separator or track guides, which can be fitted to any system.

Connector pieces

A connector piece is used to join two roller tracks together.

With **ergonomic order-picking**, a distinction is made between:

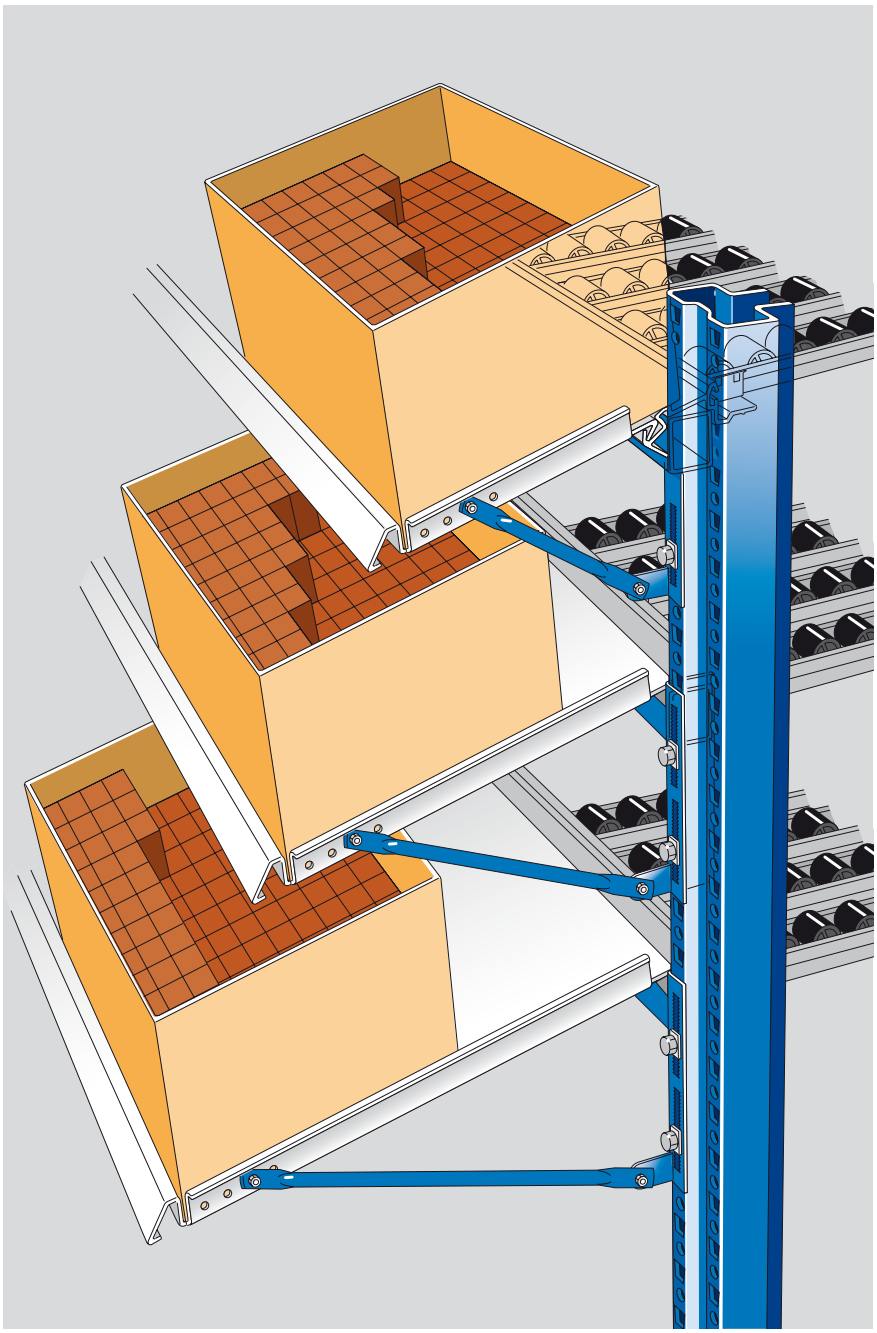
- taking out complete packages
- picking separate articles from open-top plastic containers or boxes.

Vertical rack front

For use where complete packages are taken out, or where articles are collected from open-fronted containers.

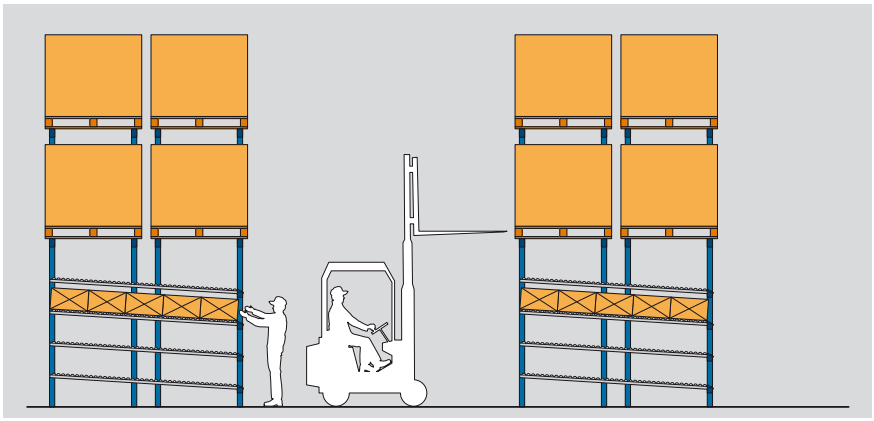
Fronts with presentation shelves

When goods are picked from open-top containers or boxes, presentation shelves with an adjustable angle are desirable, to improve access and enlarge the pick opening. The ideal angle can be adjusted for each rack level. It is also possible to install deeper presentation shelves at lower levels.



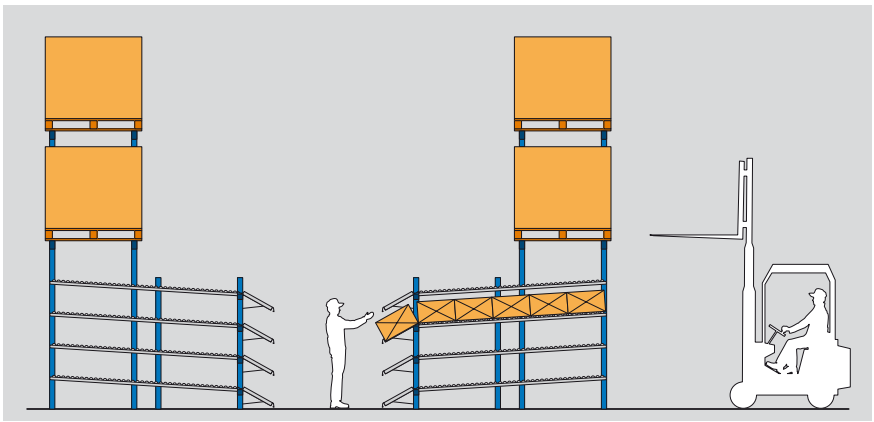
Rack configurations

Improved space utilization can be achieved by creating bulk storage space above the order-picking racks. Therefore, the beam lengths of both systems must be the same, which is possible as all our systems are compatible.



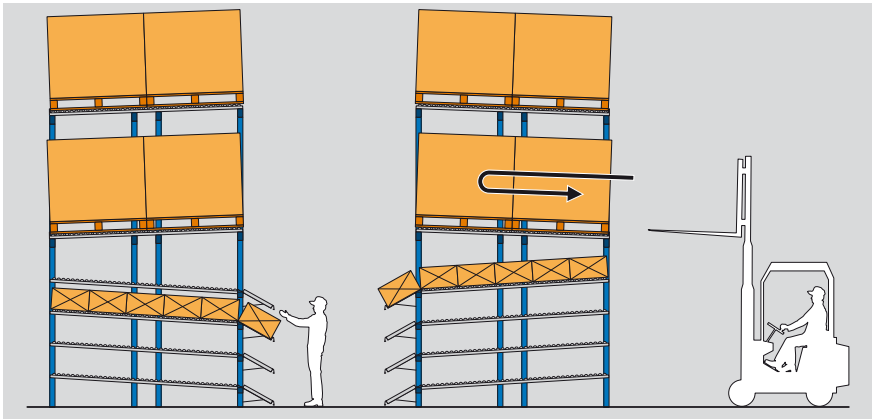
Example 1

Aisles between the racks are used for order-picking and forklift trucks.
No presentation shelves are fitted because of their vulnerability; this gives a vertical rack front.



Example 2

Separate aisles for order-picking and forklift trucks create a safer working situation.
The rack front for order-picking can now be fitted with presentation shelves.
There is less space available for bulk storage.



Example 3

By installing push-back roller tracks, the maximum amount of pallet space for bulk storage is created above the order-picking racks.

Ramp stops

Brake operating ramp stops can be fitted as end buffers in conjuction with heavy-duty roller tracks.

Anti roll back device

After the crane has positioned the container at the input side, it can be manually pushed back up the slope and held in position by an anti roll back device. Then, it can be removed and relocated by the crane.

Patent: G EP 98.100244.7

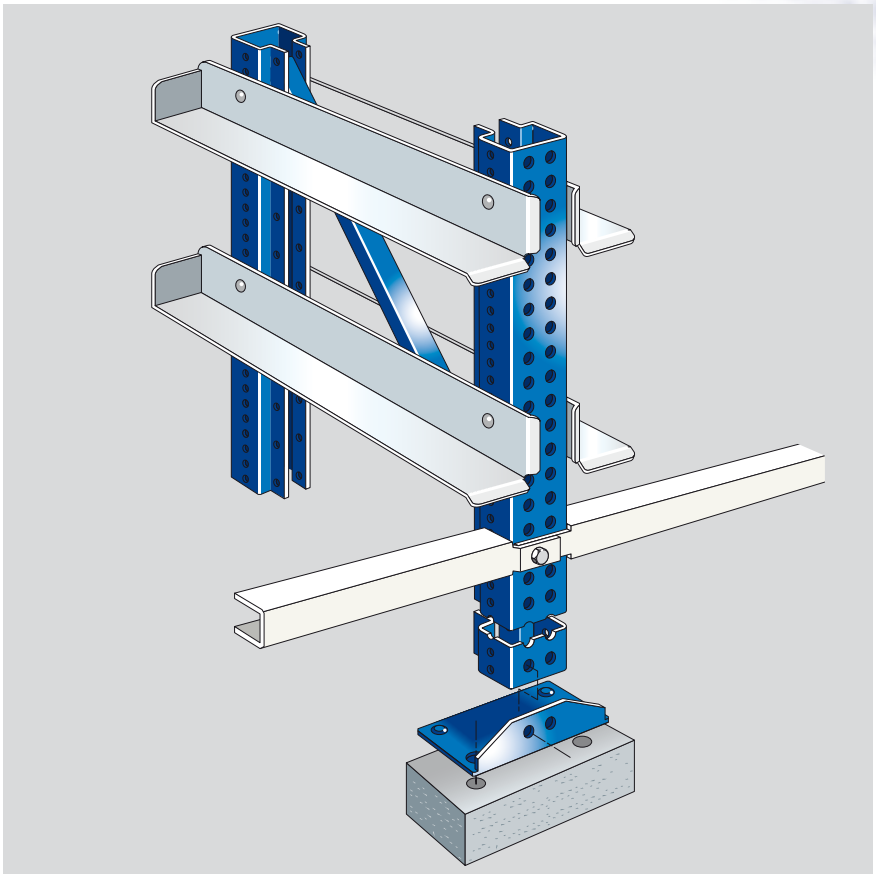
Push-back protection

When automated handling equipment is used for positioning containers on the input side, it is recommended that push-back protection is fitted on the roller tracks, so that the containers can not protrude into the crane-operating aisle.

A mini-load system is often used for the buffer store in an automated small parts system. This will automatically replenish the live storage racks in the order-picking system.

Order-picking systems are often complemented using pick to light, conveyor and sorting systems.

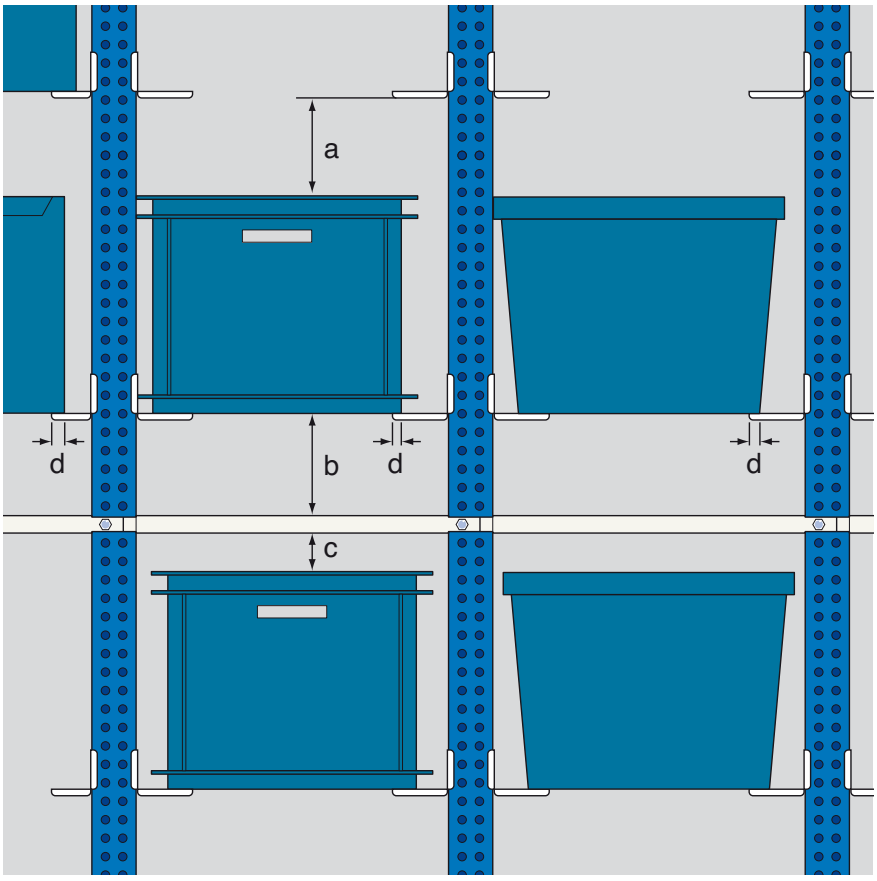
Miniload systems are increasingly used because the automation of small parts storage provides considerable advantages. Open face miniload systems are used when rack cranes pick up the goods using telescopic forks or forklift techniques.



Nedcon has developed a range of unique racking components for many system partners and for different load handling devices.
Nedcon has installed a large number of systems with structure heights to 30 metres for single or double-depth storage. A miniload Light version is available for application under less demanding circumstances.

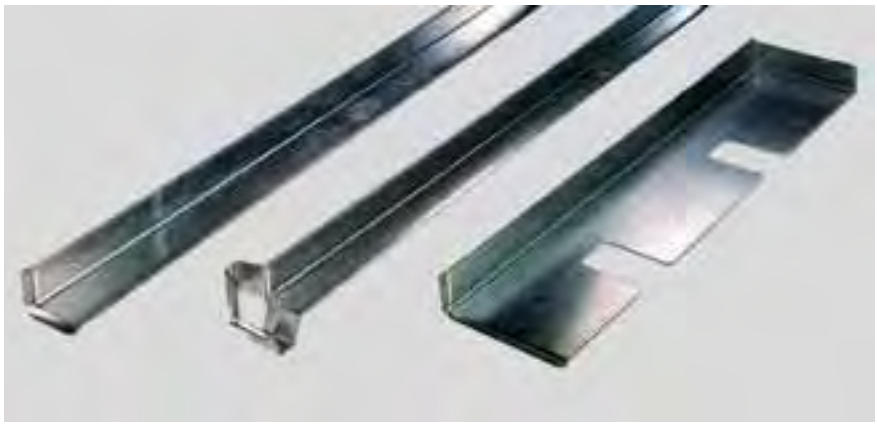
Dimensions

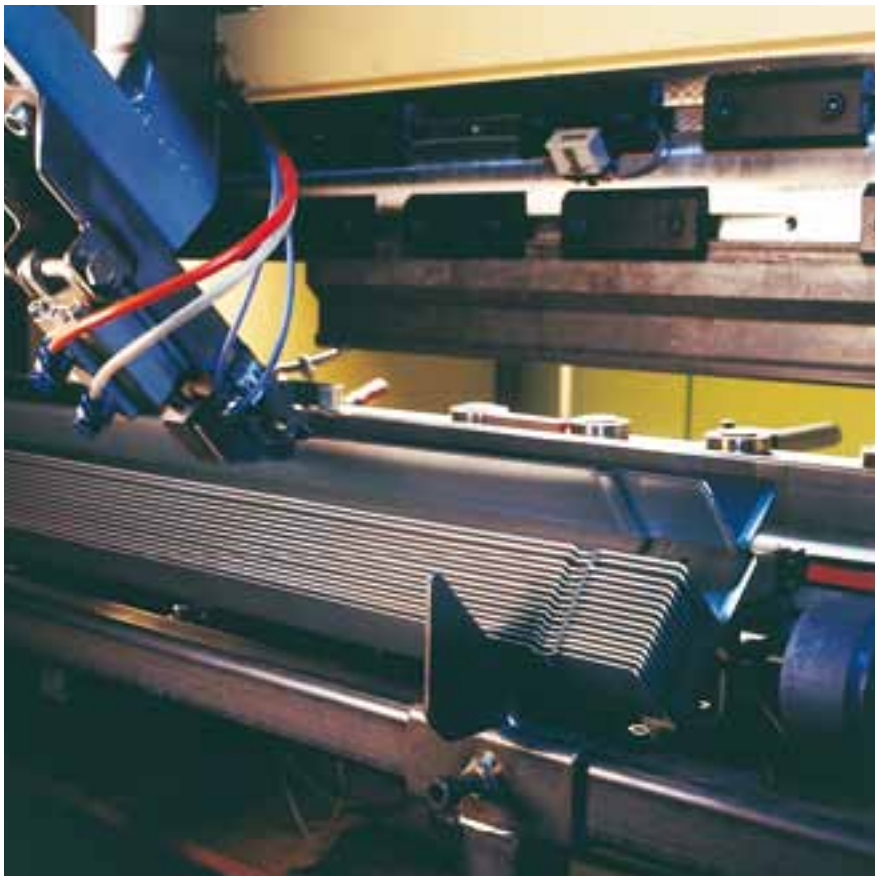
In order to fit the maximum number of containers in the racks, the vertical and lateral tolerances must be kept as small as practicle. However, tolerances that are too small could create operational and positioning problems. The correct tolerances are also an advantage for limiting the eccentric loads on the angular profiles. The dimensions given in the drawings have to be determined very precisely in each case, in consultation with the system partner, whilst taking into account the design of the containers.



4


01
02
04





Angular profiles as load carriers

In an open face miniload system, each rack location has a left and right-angular profile as load carrier. The space between the load carriers allows for the telescopic forks to position or remove the containers.

Where a narrow telescopic fork is fitted with a transverse profile, cut-outs are also possible, in order to improve the support of the various goods.

Load carriers for tapered containers and Omega-shaped load carriers are protected by patents.

Production

Nedcon has two automated production lines for the manufacture of load carriers, and therefore has an extensive volume production capacity available, in order to satisfy the requirements for large projects.

Height divisions

The standard perforations in our upright profiles are 12,5 mm. However, with our freely programmable perforation technique project specific combinations are available.

Design

The length of the angular profiles (400 to 2,950 mm) depends on the dimensions of the goods. Profile dimensions and material thickness are dependent on required positioning tolerances, the shape and weight of the goods and primarily the extent of eccentric load transfer. The corner profiles have entry guides and push-through protection.

Pull technique

Open face miniload systems are also suitable for cranes that are fitted with a system for clamp or pull technique. With such systems, however, beam type racks are preferable.

Fittings

Fittings are necessary for all automated storage systems:

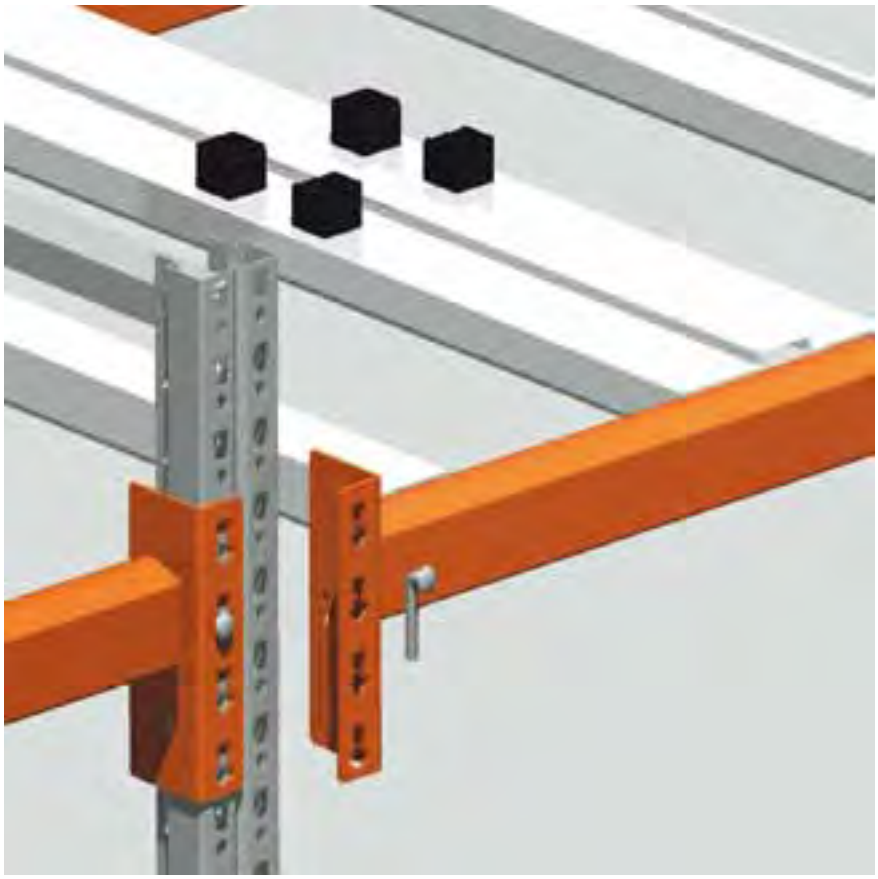
- sprinkler fittings
- maintenance platforms
- support construction for conveyor systems
- platforms for visitors
- safety fences and doors with electric interlocks
- run-out constructions for cranes

Nedcon has the knowledge and experience to design and produce such essential fittings.

Small parts management, storage and order-picking

The replenishment stock of an order-picking system can be automated using a miniload storage system.

Combinations of systems, such as miniload systems and carton live storage for small goods offer many advantages. Nedcon has developed special components, which combine miniload systems and carton live storage systems.



Miniload systems – beam type

Beam type miniload systems can be serviced by cranes, fitted with a pull or clamp system for retrieval and deposit. The beam type racking is better suited to large construction heights as it has better load-bearing capacity than the open face type. The reduced building time emphasises the cost effectiveness of the system.

Load carriers

Nedcon has developed a range of Sigma and Omega-shaped load carriers with backstops and entry guides. These also fulfil the requirements laid down for sprinkler systems. The beams have exceptionally accurate system perforations for crane positioning and for hooking-in the load carriers. These ensure quick, accurate and safe assembly.

Patent: US and EP patents pending.

Design: 96.12.0733.9

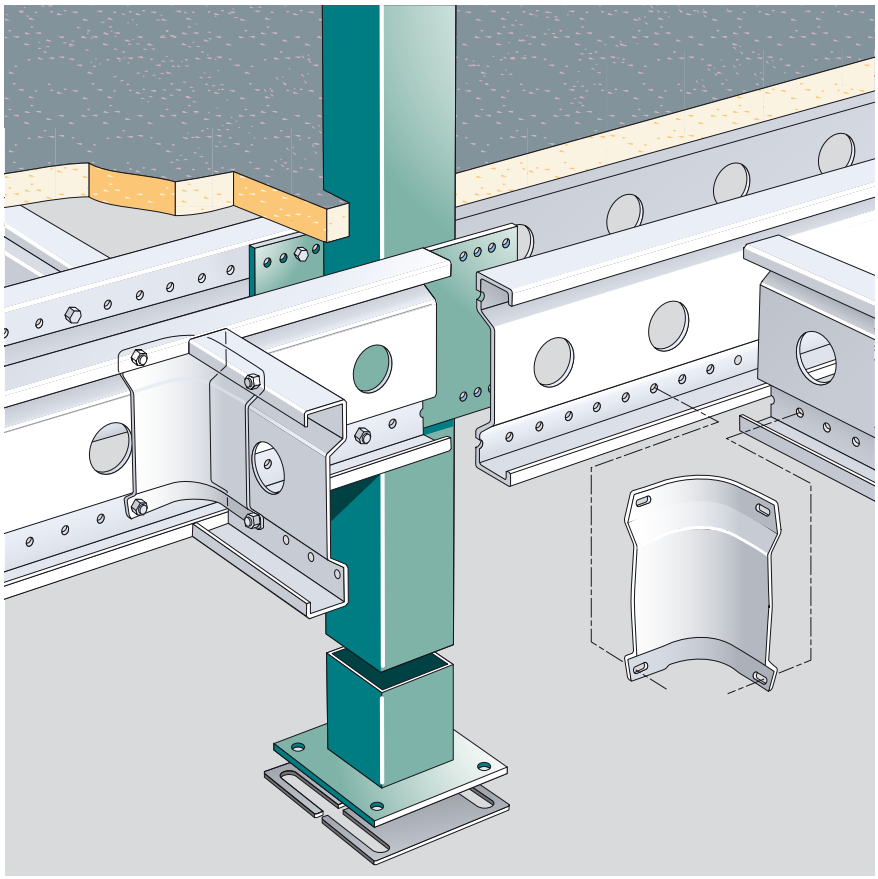
Hook-in: 97.10.8859.

Double-deep storage is possible when using the pull technique by means of purpose made trays, giving optimised space utilization.
With deep racks consideration should be given to beam type miniload systems, as the Omega profiled load carriers are both stringer and stiffer than the angular profiles used in open face racking. The Omega profiled load carrier is also much less torsion sensitive than the angular profiles.

Safe, accurate and reliable installations are possible, even in deep racks, with Nedcon's patented 'snap-in' construction.

Storage systems for specific goods

Advanced storage technology



Relocateable concept

An economical, relocateable system has been developed for the construction of system floors.

Unlike conventional steel constructions, this system can be easily expanded, moved or simply modified for different load requirements at a later date.

Serial production is possible due to the limited number of components in this system.

The load-bearing components of this system are:

- cold-rolled main and secondary beams, in the shape of Sigma profiles
- special **patented profile connectors** to join main and secondary beams
- columns in a range of sizes
- various types of floor panels

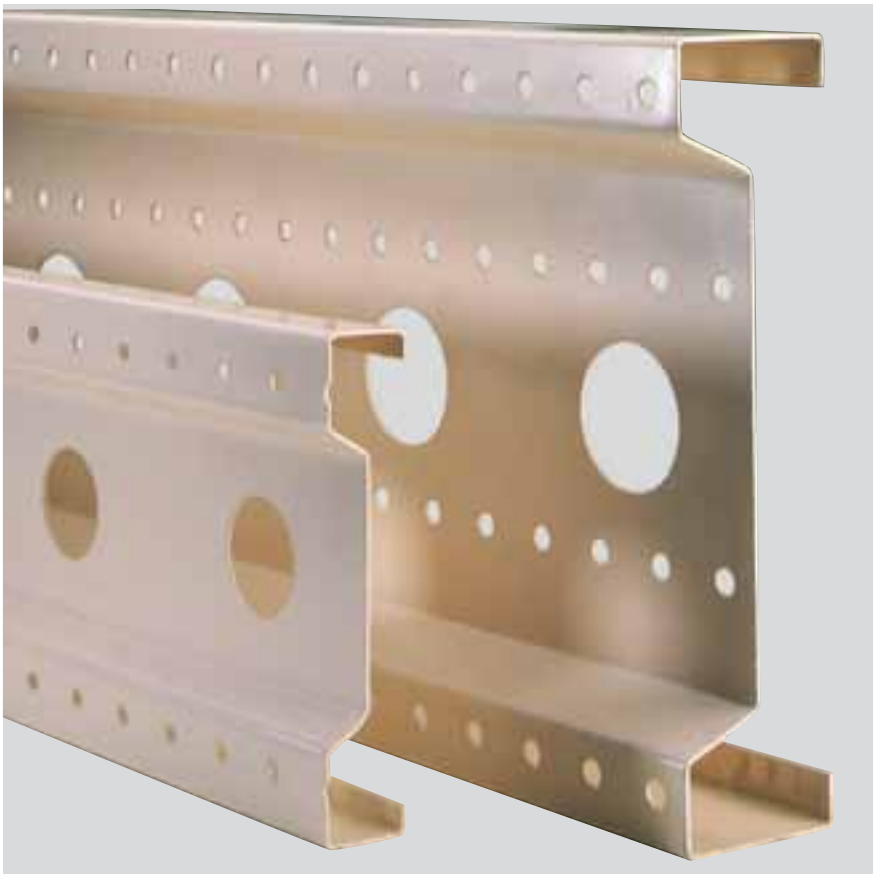
Using these basic elements in different combinations enables a wide variety of span lengths to be achieved, giving permitted loads from 300 to 1,200 kg/m^2.

Flexibility

Mezzanine floor systems are not only considerably cheaper than structural floors, but also provide more flexibility for cut-outs for stairs, lifts and conveyors. Also, different types of decking are available.

The fitting of air ducts, heating panels, and other systems and accessories is possible without problems.

As well as the system perforations for fittings, large perforations in the neutral line of the profile allow fast and efficient installation for sprinkler pipes and electrical cables.



The **Sigma profiles** are a development of 'in-house' technology. The size and dimensions of these profiles ensure that they are hardly sensitive to torsion under load, due to the fact that the shear centre coincides with the web of the profile.

Nedcon produces these Sigma profiles in its own factory, in a wide range of dimensions (130 to 410 mm profile height) and with different thicknesses. All types are cold-rolled from high-quality, certified micro-alloy steel, finished with an epoxy-polyester powder coat.

Profile connectors

The joint between main and deck beams is a very important connection for the stability of the structure. High loads must be transferred from a deck beam to the main beam. Deformation will occur unless all of the vertical forces are transferred through the connecting element. Nedcon has developed a connector element that will transfer very high loads safely, without deformation occurring at the joint.

Patent: EP 0 699 840 B1

With very large span lengths, extra heavy-duty, hot-rolled steel profiles can be used as main beams. The main beams can also be installed on concrete building columns. To do this properly Nedcon developed constructionally certified sliding supports.

The **mezzanine floor systems** can be made as panel or grating floors.

Panel floors are available in a variety of strength options and a range of thicknesses from 28 to 60 mm, which have considerable differences in bending strength (10 to 22 N/mm^2) and modulus of elasticity (1,900 to 3,500 N/mm^2). Final choice could be influenced on whether evenly distributed or concentrated wheel loads from electric pallet trucks, for example, are imposed. The floor panels, which are available in large sizes, are usually manufactured in high density particle board. These panels are connected together by means of a tongue-and-groove when not supported by the steel construction.

Steel gratings are used in some areas in an installation to provide air circulation. However, they are usually limited to specific situations, because they can allow debris to fall through, are noisy and could prevent the use of pallet trucks.

Heavy-Duty panels

Nedcon has developed a heavy-duty panel using a sandwich construction from very strong material, 60 mm thick, designed for very high concentrated wheel loads created by heavy electric pallet trucks.

If humidity during construction is high, chipboard panels will shrink as they dry out, creating gaps. It is recommended that the panels are fitted only when the humidity is low or normal.

Fire Safety

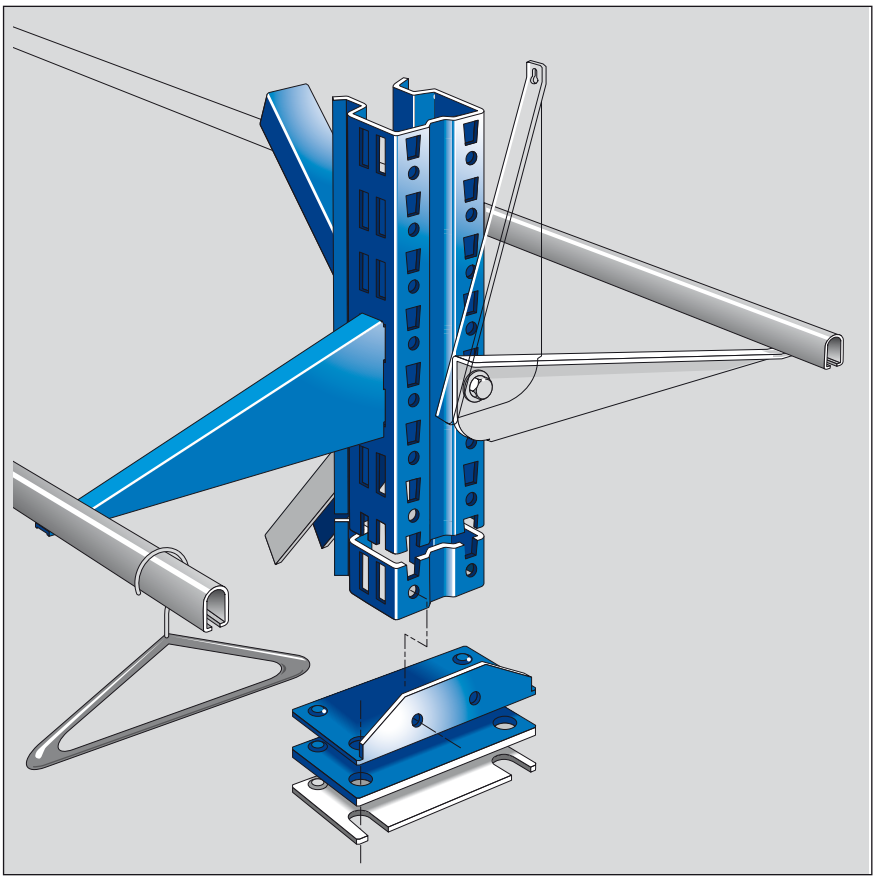
In general, high-compression chipboard panels are designated to Class B2, in accordance with DIN 4102-4. A limited number of models are available in Class B1 (hardly combustible). Nedcon can supply panels with reinforced aluminium foil on the underside that meet the requirements of Class 0 normally required in the UK.

Formaldehyde emission

All panel types conform to Class E1 (ETB guideline) and Class 1 (DIN EN 312-1); below 8 mg/100 g.

Surface finish

The top of the panels can be finished with a wear-resistant decorative surface. The wear-resistance conforms in full to the most stringent testing in accordance with DIN 68765 (87), class S (more than 650 revolutions). The underside of the panels can be finished with a white melamine surface for good light reflection.



Racks for hanging clothes

With Nedcon system components it is possible to construct complete installations for hanging garment storage.

With a modified perforation pattern in the upright profiles, cantilever arms for clothing rails can be hooked in.

This special clothing rail is profiled in our own factory, sendzimir galvanized or chromed.

This design ensures strength and stiffness in accordance with the superimposed loads of hanging garment and also minimises installation time.

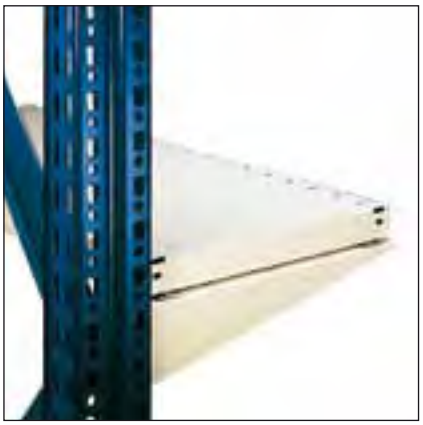
The hook-in cantilever arms are easy to adjust in height, every 50 mm.

The design allows clothes hangers to slide along the whole length of the rail.

The clothes rail can be fixed to the cantilever arm with a bolted or hook-in connection.

Folding cantilever arms are also available; these allow the racks to be used for long or short clothing, without removal.

Patent: G 94.06517.9



A third type of cantilever arm is available to allow the fitting of shelves in the same rack.

Multi-tier construction can be realised in two ways:

- using high upright frames and hook-in beams at the floor levels;
- with mezzanine floors for large beam spans.

Panel floors are usually fitted in the aisles. Floor gratings can be fitted beyond the aisles for air circulation.

The Nedcon **mezzanine floor system** is the ideal load-bearing construction for special transport techniques for hanging garments.

With the wide range of profile dimensions the best possible design for the steel construction over the desired spans can be implemented.

The load-bearing capacity calculations are carried out for every individual construction.

The system perforations are very labour saving and very precise, vital for the assembly of a hanging garment transport system.

Hanging garment storage in high-rise racks is a new development in the domain of automated garment storage. This is a system where one or more loaded garment rails are handled as a unit by a rack-handling crane.

Nedcon has developed unique depth beams and brackets with a special design, which eliminates twist of the depth beams and creates a slot to support the garment rail. The brackets are equipped with blocks for accurate crane positioning. The click system ensures fast assembly of the many brackets.

Rack protection and safety

Advanced storage technology

Upright protection

TNO research into load-bearing reduction caused by the impact of collisions has demonstrated the importance of preventing this type of damage. These photos show profiles, which have obviously been damaged. Comparative research on damaged and undamaged profiles shows that load-bearing can be reduced by between 40 to 80 % due to damage caused by collisions.
Protective measures are essential for the safety and durability of the whole structure.

Upright protectors with impact deflecting design and wheel deflectors at floor level can assist in preventing.

Corner protection

The corners and sides of a rack block are vulnerable places for damage caused by collisions. Corner protectors accommodate impacts and protect the corner uprights (obligatory in accordance with AI 14, NEN 5051 and ZH 1/428). Energy absorbing rubber anchoring blocks ensure that, even if corner protectors are damaged, the concrete floor remains intact. This allows easy replacement with minimal disruption to the operation.
Nedcon also uses two anchor bolts, one on either side of the upright, so that, if struck, torsional damage is greatly reduced.

End protection

A combination of sigma heavy-duty sections and corner protectors provide substantial protection to end frames.
In addition, Nedcon can use different frame bracing to eliminate the damage, which usually occurs at the lowest frame diagonals.

Cross aisle protection

Damage caused by constant cross aisle traffic can be eliminated by using single or double sigma sections with intermediate floor supports and energy absorbing corner protectors.

www.nedcon.com