



**ADJUSTABLE PALLET RACKING  
SELECTION, OPERATION & MAINTENANCE GUIDE**



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## Introduction

The purpose of this document is to stress the importance of ensuring that the racking installation continues to be both serviceable and safe.

The first factor to be conscious of is that, for economy, racking components are produced from light gauge sections and this naturally limits the amount of abuse which can be absorbed without impairing recognized levels of safety.

Certain user industries are particularly prone to abusive damage involving the racking. Such conditions occur where high turnaround and rapid movement of goods form the main activity, particularly where reach and counterbalance trucks are used in over-wide aisles. Unit loads and pallets in poor condition can also be a hazard, whilst floor cleanliness; operator skill level and condition of the fork lift trucks have a considerable influence on the ability to maintain a safe racking installation.

If all the foregoing has received due consideration, it still remains the responsibility of the user to maintain the racking in reasonable condition. Driver training and regular inspections best achieve this. Inspections should be seen as planned maintenance and carried out on a regular basis. Warehouse staff should be encouraged to report any damage incurred, however minor, so that its effect on safety can immediately be assessed.

Dexion will assist the user in identifying the deficiencies, and if required advise on the frequency of inspections.



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## What are the key elements associated with racking?

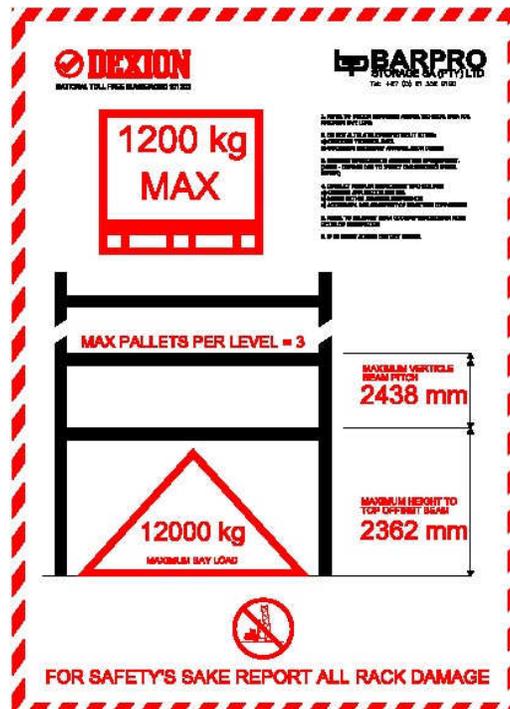
The following factors should be taken into account when considering the safety of your racking:

- **Is the racking erected on sound, level floors?**
- **Is it installed in accordance with the manufacturer's instructions?**
- **If secured to a building, has this been approved by a structural engineer?**
- **Are double-sided rows connected and spaced using appropriate row spacers, and at the minimum required intervals?**
- **Is the racking fixed securely to the floor?**
- **Are the aisles wide enough that the mechanical handling equipment can easily be maneuvered?**
- **Are beam connector locks securely fixed at both ends of the beam?**
- **Are the maximum load notices on display?**
- **Are all racks in alignment?**
- **Are you using the correct type of pallets?**
- **Is there any obvious physical damage?**
- **Is sufficient protective equipment in use?**
- **Have you changed handling equipment since the original specification?**

**Note: A change in the type or use of handling equipment can render a previously safe installation unsafe.**

## Maximum Loading

A racking system should be designed to meet the requirements of the heaviest total palletized load. The weight indicated on the maximum loading notice should **never** be exceeded.



- Do you know the maximum load capacity of your racking?
- Do you know if you have in the past or are you currently exceeding this level?

## Rack Stability

Three of the factors affecting the stability of adjustable pallet racking are:

- **The height-to-depth ratio**
- **The type of base plate used**
- **Average beam spacing**
- **The floor fixing**

If the height to depth ratio is less than 6:1 those uprights adjacent to aisles and gangways need to be fixed to the floor.

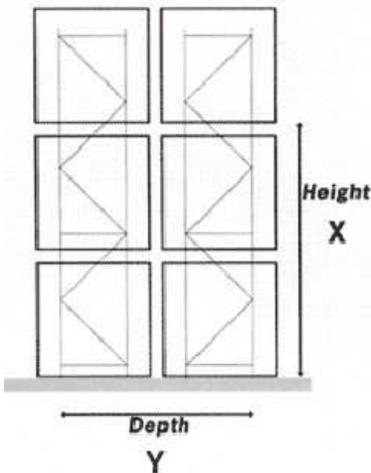
If the height to depth ratio is between 6:1 & 10:1 all uprights need to be secured.

If the height to depth ratio is greater than 10:1 specialist advice should be sought.

- **Do you know the height-to-depth ratio of your racking?**
- **Are you aware of the amount of floor fixing required for your particular system?**
- **Are any of the fixings loose?**
- **Do the beam levels in your racking fall within the limitations given on the load signs?**

Calculate your height to depth ratio:

$\frac{X \text{ (height top of beam in meters)}}{Y \text{ (depth of rack in meters)}} = \text{Ratio: 1}$



**Which pallet which rack?**

Width of frames, clearance between back to back loads, pallet overhang and weight clearance are all key considerations when deciding whether the right pallets are being used with the right racking system.

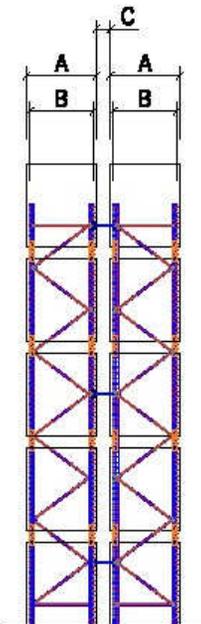
The location of pallets within racking installations depends on the type of pallet under consideration.

If you are using 2-way entry or 4-way entry timber pallets use the opposite to calculate if they are correct ones for the racking system. If the dimensions do not fall within these parameters you could be using pallets with excessive overhang or insufficient clearance.

Where:

- A = Overall depth of pallet
- B = Dimension over outside of beams
- C = Clearance between back to back pallets or loads

2 way entry pallets			4 way entry pallets		
A	B	C	A	B	C
750	600	100	750	700	75
900	700	100	900	800	75
1000	750	750	1000	900	100
1200	900	150	1200	1100	100

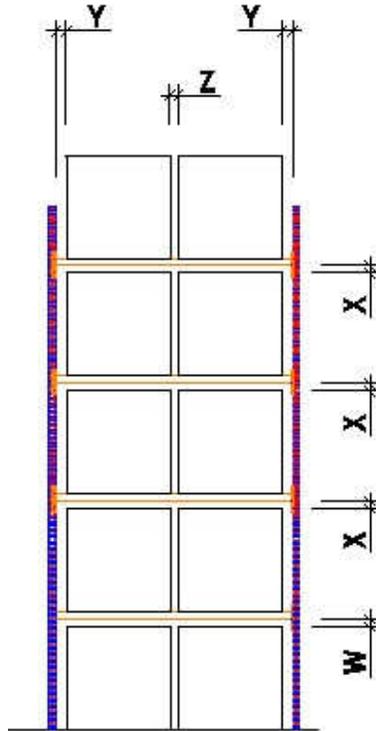


Where:

X = Clearance between underside of beam and top of load or pallet where no automatic height selection is used.

Y = Clearance between pallet or load and upright

Z = Clearance between adjacent pallets or loads



## Rack Protection

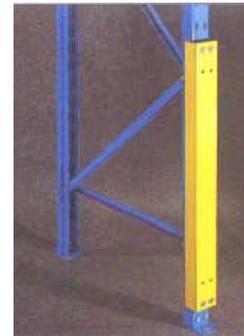
Where necessary, steps should be taken to protect corner uprights from being struck by handling equipment. A first line of defense should be incorporated, such as column guards or guide rails, which prevent the truck getting too close to the main racking structure. Column protectors in other areas likely to incur damage should be considered.



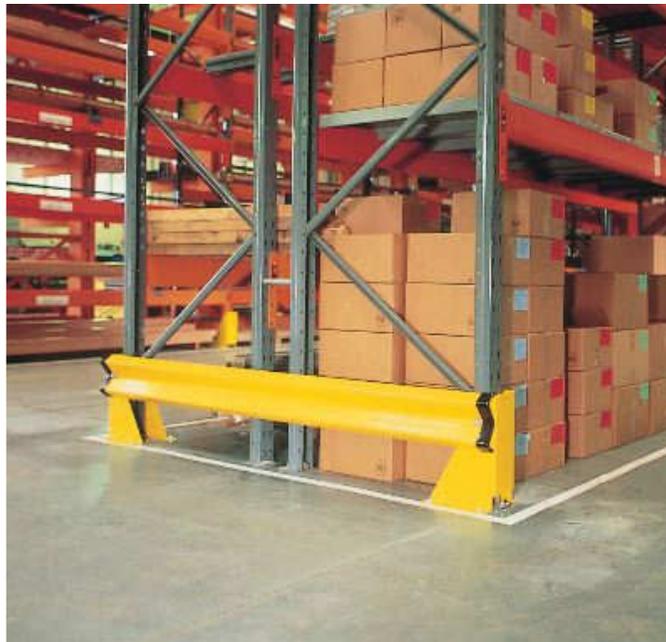
Column Guards



Rail barriers



Post protector



## Rack Inspections

It is necessary to inspect racking systems regularly for damage; typically a formal inspection should take place as follows:

- 1) Racking should be inspected for broad based serious damage on a daily bases.
- 2) Racking should be inspected more carefully, by management (supervisor) on a weekly basis.
- 3) Racking should be checked extensively and in detail on a monthly basis by management (senior supervisor).
- 4) Racking should be inspected by the manufacturer or an outside expert authority at least twice per annum.



### Used storage equipment

Used storage equipment or racking may be damaged. Ensure that the system or part can carry the intended load and is fit-for-purpose. Used components may not be suitable for a particular application. Different upright grades, beam styles and footplates are all designed for specific uses.

### Overloading and incorrect installation

Overloading or incorrect installation is another cause of rack collapses. Professional advice and correct installation procedures ensure racking is capable of standing up to the loads being imposed on it. Changing beam levels has a major impact on the original design capabilities of a rack. Adding bits and pieces or changing beam levels, may be potentially dangerous.

### Conclusion

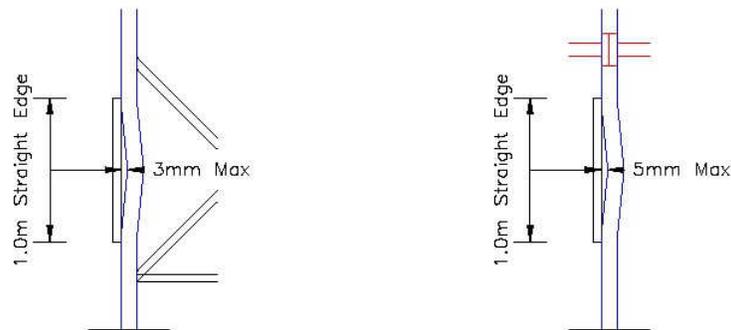
Taking all possible steps to ensure the safety of your warehouse and your staff may well constitute a strong defense in the event of a collapse and any resulting prosecution. A rack audit could well save your business, your reputation and your workers' lives by identifying possible danger areas and recommending upgraded or replacement components.

## Damage limits

Damage to frames is especially important as any deflection of the frames (in terms of damage) will greatly reduce the load carrying capacity of that upright section. The following shows a typical guideline for assessing the level of damage to a frame and the related need for immediate repairs and remedial action. It must be noted that should a frame be damaged beyond expected limits illustrated in this document, it is recommended that the frame is immediately unloaded and appropriate remedial action taken.

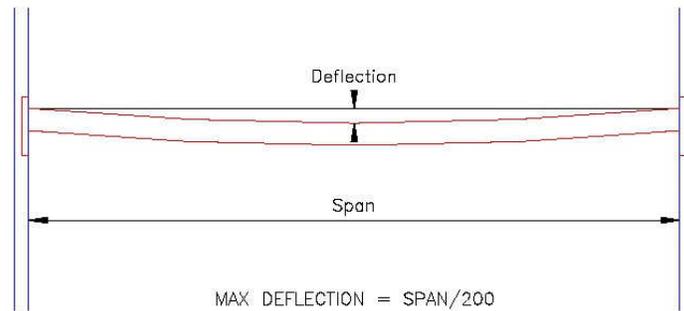
### Damage to uprights

By using a straight steel edge 1m long, one can place this alongside the frame and check the amount of damage in terms of deflection. It is generally recommended that should an upright be bent more than 3mm, that the upright is damaged to the point where action must be taken.



### Damage to beams

Beams will naturally deflect under normal loading conditions to a maximum permissible of span divided by 200. The deflection should largely disappear when the beams are unloaded. Residual vertical deformation should not exceed 20% of the normal deflection under load. Should beams not return to a normal straight position after unloading, these beams will not have sufficient capacity to carry the maximum load and should be replaced with good beams. No twisting of beams should occur under full load. Beams that show twisting should be replaced. Should beam end connectors show any deformation or damage whatsoever, these should be replaced (and/or expert advice sought). Should any damage in terms of metal or weld split on beam end connectors occur, beams should be replaced immediately.



#### Damage requiring Replacement

- That which significantly changes the original cross-sectional profile of any main-load-bearing member
- That which deforms the straightness of any main-load-bearing member
- That which significantly weakens jointed members
- Damaged or wrong type pallets

#### Hazards requiring attention

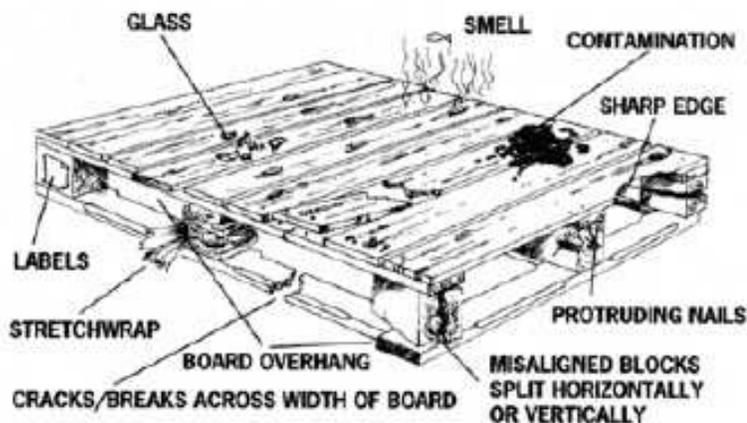
- Mis-alignment of racks
- Incorrect location of beam connectors
- Looseness of floor fixings
- Dislodgement of accessories
- Spillage of goods
- Floor soilage
- Fork lift truck deficiencies
- Missing beam locks

## Pallets and mechanical handling equipment

Flat timber pallets form an essential part of mechanical handling systems in warehouses. Accidents are usually a result of:

- **Poor design**
- **Poor construction**
- **The use of a pallet which is unsuitable for a particular load**
- **The continued use of a damaged pallet**
- **Bad handling**
- **The use of a pallet which is unsuitable for a particular racking system**

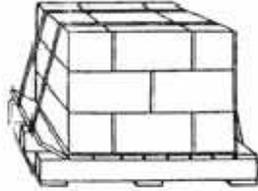
### Common defects that could render a pallet unfit for use



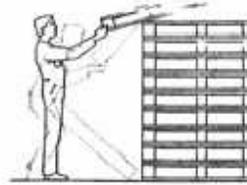
For safe pallet use the following points should be considered:

- **An effective pallet damage inspection and out-sorting routine should be established**
- **All pallets should be inspected each time before use with damaged pallets being repaired or destroyed**
- **Empty pallets should be carefully handled**
- **Care should be taken to ensure guide wheels on pallet trucks do not damage pallet baseboards**
- **Care should be taken when using strapping**
- **The correct type of pallet for the right racking system must be used**
- **The forks of a handling device should extend into the pallet to at least  $\frac{3}{4}$  of its depth.**

## Common pallet handling faults



Tight strapping of too small loads can distort deckboards.



Any sliding and dropping action should be avoided.



Ramps and bumpy floors can cause loads to be jolted and bases of pallets to be grazed.



Poor Manhandling - for example misuse of a sack truck - can loosen boards.

Mechanical handling equipment is used extensively in storage areas and is covered by a multitude of directives. However it may be worth finding out the following:

- Are all lift-trucks displaying a data plate?
- Are you working within the limits of this data?
- Are all brakes, safety locks, warning devices, overhead guards and operating lights on the trucks in safe working order?
- Do you know the derated capacity of lift-trucks fitted with attachments?
- Have all operators using forklift trucks been properly trained?
- Do all trained operators attend refresher courses?
- Is there a system to ensure remedial work is carried out?
- Are planned routine maintenance programs in operation?

## What are my responsibilities?

The responsibility for avoiding accidents and occupational ill-health lies with the employer and employees. Pleading ignorance is not a defense. Responsibility could therefore fall upon:

- The company;
- The line manager; or
- The employee

It is the responsibility of every member of an organization to ensure that:

- All actions are taken to ensure that plant and systems are safe and without risks to health; and
- Where safety hazards exist or risks have been identified, they are brought to the attention of the relevant parties.

In addition to the financial aspect the consequences can be far reaching:-

- Injury or even death to employees
- Disruption to the organization resulting in costly downtime
- Damage to the materials being stored resulting in loss of revenue
- Damage to third party materials and loss of goodwill
- The bad publicity that may occur
- Escalating insurance premiums
- Claims for negligence





**What environmental elements need to be considered?**

Can you honestly answer yes to the following questions?

<b>Layout of storage areas</b>	<b>Yes</b>	<b>No</b>
All hazards have been identified and risks assessed		
People and vehicles are segregated as far as possible.		
One way systems in operation are in operation or have been considered		
Emergency exits are clearly marked, easily opened and readily accessible		
Lift trucks and vehicles operate on flat and unobstructed surfaces		
All storage areas and gangways are clearly marked		
External doorways used by handling equipment are protected from adverse weather conditions		
Access to automated areas are strictly controlled		
All workstations are adequately protected		
Protective equipment is of the correct duty and is correctly fitted and maintained		
Rack uprights and rack ends are adequately protected		
All loads and stacks are stable		
<b>Floors</b>		
All floors are capable of bearing the weight to which they may be subjected for the life of the floor		
All floors are designed to withstand damage		
Floors are not slippery		
All mezzanine floors are marked with safe loading capacities		
Where personnel are allowed access to mezzanine floors all openings and edged are guarded		
All floors are flat, level and free from holes		
<b>Lighting</b>		
Lighting is sufficient to maintain safe and workable conditions		
<b>General Housekeeping</b>		
Aisles area always clear		
Stock does not project from a rack or shelf and does accumulate in aisles		
Spillages are immediately cleaned-up		
If the floor is wet or being washed signs are always deployed		
Equipment is regularly inspected and maintained		
The pallets in use the correct ones for the job		
All pallets are in good condition		

The points raised above are by no means a complete list of all the possible risks. Reputable storage manufacturers and specialized companies can carry out rack safety surveys on your behalf.

## How can training help?

Many accidents occur in the workplace due to:

- Employees being insufficiently trained.
- Failure to report possible safety hazards
- Failure to report 'near misses'

You may find it useful to ask yourself whether all individuals within your department, including yourself, are aware of the following:

- What is the best method of carrying out the work?
- What equipments is to be used?
- How does the equipment work?
- What dangers are associated with its use?
- What safety precautions are needed?
- How can equipment be cleaned safely?
- Are preventative maintenance and inspections programs in place?
- What is the procedure if equipment is faulty?
- What personal protective equipment should be worn?
- Is formal training required to operate the equipment?
- What safety measures are required throughout the department?

It is only when all individuals who report to you are aware of all the potential hazards within an area, risks have been assessed and corrective action has been taken, that you can declare you have carried out your responsibilities to the full.



**What do I need to know before purchasing a new storage system?**

Factor	Racking	Shelving
Pallet size		N/A
Pallet type and construction		N/A
Pallet load carrying capacity		N/A
Unit load weight		
Unit load dimensions		
Unit load security		
Unit load stability		
Type of handling equipment required (manual or mechanical)		
Maximum lift-height of handling equipment		
Dimensions of handling equipment		
Storage area dimensions		
Storage floor type (i.e. suspended or ground bearing) and construction		
Floor loading capacity		
Obstructions in the storage area (i.e. emergency exits, stairs etc)		
Floor fixing facilities in the storage area		
Type of goods to be stored		
Frequency of movement and access		
Fire protection requirements		
Specialist equipment or accessories required		
Protective equipment required		

Although not an exhaustive list, this will enable the manufacturer and yourself to specify storage systems that meet your requirements **safely**.

## Are second-hand storage systems safe?

The health & safety in Retail and wholesale warehouses states that:

**“...Safe working loads, heights, widths and equipment tolerances should be set by the designers and manufacturers of the total system... Racking should be installed in accordance with the manufacturer’s instructions”.**

Any changes in the conditions that the storage system is working under can affect the integral safety of the system. If storage systems are relocated, rebuilt or are second-hand they must still be installed in accordance with the manufacturer’s instructions.

- Have you made a ‘safe’ purchase?
- Are second hand storage systems installed in accordance with the manufacturer’s instructions?
- Do you know the conditions under which the system was previously used?
- Have you arranged for an inspection of the equipment?
- Are you positive that the system will safely store your goods?



## Usefull contact information

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