

# Drive-In Pallet Racking User Manual



BLANK



# DEEPSTOR

## DRIVE-IN PALLET RACKING

# USER INSTRUCTIONS

This manual remains the sole property of Dexion (Australia) Pty Limited. It must not be copied without prior written consent and must be returned upon request.

**The information contained within this guide relates solely to the Dexion product, it doesn't necessarily relate to other similar systems available from alternative sources and should not be used as the basis for operating these alternatives**

Whilst the utmost care is taken to ensure the accuracy of the data and design details shown within, Dexion (Australia) Pty Limited cannot, under any circumstances, be held liable for any injuries, expenses or loss which may, in any degree, be attributed to the use or adoption of such data and design details.

© Copyright:

Dexion (Australia) Pty Limited  
Tattersall Road  
BLACKTOWN NSW 2148

Product Management  
Tel: +61 2 9830 5000  
Fax: +61 2 9830 5003  
E-mail: [Technical@dexion.com.au](mailto:Technical@dexion.com.au)

Date of Issue: August 2003



**MANUAL AMENDMENT REGISTER**  
**DEEPSTOR USER INSTRUCTIONS**

Issue / Amendment	Date Issued	Description	Inserted By
<b>Issue 1</b>	<b>Aug 03</b>	<b>Original Issue.</b>	

## TABLE OF CONTENTS

<b>INTRODUCTION .....</b>	<b>1</b>
OPERATOR TRAINING .....	1
INSTALLATION DATA SHEET .....	2
GLOSSARY OF DEXION TERMINOLOGY .....	4
<b>THE PALLET .....</b>	<b>5</b>
PALLET TYPE AND SIZE .....	5
IMPORTANT NOTES: .....	5
LOAD ON THE PALLET .....	5
PALLET WEIGHT .....	6
PALLET CONDITION .....	6
PALLET ILLUSTRATION .....	7
<b>THE FORK LIFT TRUCK (FLT) .....</b>	<b>9</b>
LIFT HEIGHT .....	9
CORRECT FORK LENGTH .....	9
DRIVER TRAINING .....	9
DAMAGE TO STORAGE EQUIPMENT .....	9
CARE AND ATTENTION .....	9
<b>OPERATIONAL CLEARANCES .....</b>	<b>10</b>
LOAD ON THE PALLET .....	10
LOAD WITHIN THE LANE .....	10
LOAD BEARING ON THE PALLET RAIL .....	10
DELIVERY CLEARANCE .....	10
FLT CLEARANCE .....	11
<b>LOADING / UNLOADING THE SYSTEM .....</b>	<b>12</b>
PICKING UP THE PALLET .....	12
CORRECT LOADING/UNLOADING PROCEDURE/SEQUENCE .....	12
APPROACHING AND ENTERING THE RACK .....	13
UNACCEPTABLE PALLET HANDLING .....	13
NEVER WORK BENEATH STORED PALLETS .....	13
LOADING THE SYSTEM .....	14
UNLOADING THE SYSTEM .....	15
SAFETY – NEVER WORK UNDER PALLETS .....	16
CLEANING THE INSTALLATION .....	17
<b>ROUTINE INSPECTION / MAINTENANCE .....</b>	<b>18</b>
‘RACK SAFETY OFFICER’ / ‘REPORTING PROCEDURE’ .....	18
COLOUR CODING FOR RISK IDENTIFICATION .....	18
INSPECTION INTERVALS .....	19
<b>DAMAGE TO THE STORAGE EQUIPMENT .....</b>	<b>20</b>
INTRODUCTION .....	20
COMPONENT RECOGNITION .....	21
REPORT ALL DAMAGE .....	21
REPLACE DON'T REPAIR .....	21
DAMAGE INSPECTION - LOAD ARM AND SAFETY LOCK .....	22
DAMAGE INSPECTION – PALLET RAIL .....	23
DAMAGE INSPECTION – RAIL SPLICE & FIXING .....	24
DAMAGE INSPECTION – TOP / BACK BRACING & FIXING .....	25



---

DAMAGE INSPECTION – FRAMES .....	26
DAMAGE INSPECTION – RACK OUT-OF-PLUMB .....	27
<b>RISK ASSESSMENT .....</b>	<b>28</b>
GREEN RISK .....	28
ORANGE RISK .....	28
RED RISK .....	28
DAMAGE ACTION PROCEDURE FLOWCHART .....	29
TYPICAL CAUSES OF DAMAGE .....	30
PRECAUTIONS AGAINST DAMAGE .....	30

## INTRODUCTION

**Deepstor** is the product name for the Dexion drive-in pallet racking system.

The system comprises parallel rows of frames and individual uprights, interconnected in the left to right direction with top ties, and in the front to back direction with pallet support rails. Top bracing, back bracing, and frame bracing provide the structure with overall stability. The system has been designed to handle timber pallets, and comprises a number of storage lanes, made up of pallet rails, supported on arms, which are connected to the rack uprights.

The system is devised so that a forklift truck may enter the rack to deposit a pallet at the rear of the storage lane. Subsequent pallets are then stored sequentially above and in front of the original pallet, thus providing good density of storage within a given area. Pallets are retrieved sequentially in reverse order with the truck entering the rack to access the pallets at the rear of the installation. This is a "Last In, First Out" storage system. **(LIFO)**

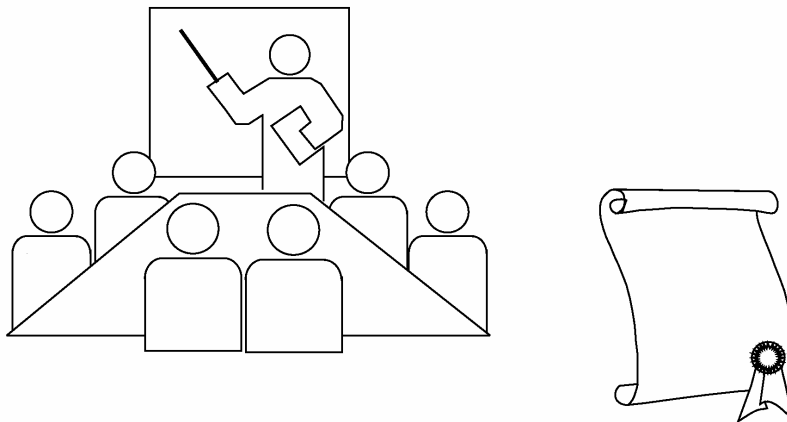
**These instructions describe the principals of the Deepstor pallet racking system, how to safely operate the racking, damage recognition, inspection, maintenance, etc. The guide does not go into the specifics of individual installations.**

## OPERATOR TRAINING

Dexion recommends that **ALL** personnel operating within a warehouse environment are trained in safe working practises.

Part of the training given to fork lift truck drivers should include the correct use of the Deepstor installation. This should include the recognition of pallet types, checks on suitability, and the correct method of loading and unloading the racking.

These guidelines describe how to use the system safely and should form part of your training. A copy of this document should be made available to all drivers.



**INSTALLATION DATA SHEET**

Your installation has been designed around a pallet with the following characteristics.

Client:	<input type="text"/>	
Date of Installation:	<input type="text"/>	
Dexion reference:	<input type="text"/>	
Block Ref. or Rack Area:	<input type="text"/>	
Pallet Type:	<input type="text"/>	
Pallet size:	x	mm.
Pallet handled on the:		mm face.
Load size (left to right)		mm.
Load size (front to back)		mm.
Any load overhang must be even on both sides.		
Pallet + Load Height:	<input type="text"/>	mm.
Pallet Load:	<input type="text"/>	Kg maximum.
FLT Widest Part	<input type="text"/>	mm
FLT Clearance	<input type="text"/>	mm



**To ensure safe use of the storage equipment, the user must understand the following points:**

**Use of the equipment**

The installation must be used in accordance with the specification and the criteria used for the design of the rack. The duty of the rack components will have been specifically selected to meet the individual load requirements of each rack. It is important that these are not exceeded and that the rack is not altered without consultation.

**Installation**

The storage equipment must be built in accordance with the specification, plans, and assembly instructions.

**Floor**

The warehouse floor, which is the racking foundation, must be capable of withstanding the upright loads and of receiving the baseplate floor fixings. It must have a suitable degree of surface level tolerance and flatness.

## **GLOSSARY OF DEXION TERMINOLOGY**

The following terms are referred to within this guide.

<b>Rack/Block:</b>	The complete structure, in length, depth and height, consisting all lanes and levels from the front of the rack to the back.
<b>Lane:</b>	A proportion of the rack separated by support frames includes all levels in the height.
<b>Level:</b>	An individual storage level within a lane. Could be either at floor level or at a raised level where the pallets are stored on pallet rails.
<b>Pallet Rails:</b>	Horizontal supports either side of a lane to support pallets at raised levels.
<b>Support Arms:</b>	Cantilever brackets that attach to the rack uprights to support the beam rail.
<b>Bracing:</b>	Fitted within selected lanes at the top, rear and lane sides to provide the structure with necessary stability.
<b>Stop the truck:</b>	The expression “stop the truck” means that the drive is neutralised and the brake is applied.
<b>Drive slowly:</b>	The expression “drive slowly” means travelling at a speed not exceeding 2.5km/h.
<b>FLT</b>	Fork Lift Truck
<b>FLT Clearance:</b>	Clearance between Support Arm / Rail and the widest part of the forklift truck (i.e. mast or driver cab).

## THE PALLET

The following gives general information about the pallet.

### PALLET TYPE AND SIZE

Your Deepstor rack will have been designed around a specific pallet style and dimensions, this will be detailed within “**The Installation Data Sheet**” on page 2.

The most common and widely used industrial pallets have also been illustrated on the following page to aid identification.

- The Australian Standard Pallet 1165 x 1165
- European Pallet: EUR 800 x 1200mm
- Industrial: IND (Fin-pallet) 1000 x 1200mm
- The (UK) GKN pallet 1000 x 1200mm

The Australian Standard pallet is a 2-way entry pallet, which is normally handled on either of the two opposing sides where the end of the bearers are exposed (refer to the pallet illustration). The other industrial / European pallets can be handled on either the long or short face, which make them known as ‘four way entry’ pallets.

### IMPORTANT NOTES:

1. **The orientation of pallet is important. Note the direction of pallet entry and ensure that pallet is supported by pallet rails on the sides parallel to the entry direction. That is along the bearer length for the Australian Pallet and short sides for the other three pallets.**
2. **Whichever pallet your installation has been designed for it is important that only the correct pallet be entered into the installation. It is dangerous to mix or enter any other pallet style or size other than those the system has been designed for.**

### LOAD ON THE PALLET

The stability of the load on the pallet is important. Ideally loads will be shrink-wrapped or banded in preference to loose stacking. There should not be any loose wrapping or banding on the bottom of the pallet. Interlocking of individual items is better than an un-structured placement.

Any load overhang (if permitted) should be even on both sides of the pallet. Ideally loads should be perpendicular and not lean, however this is rarely practical and the following deviation is acceptable:

Pallet height up to 2000mm:	Max. 1% of the pallet height.
Pallet height between 2000 and 3000mm:	Max. 20mm.

## **PALLET WEIGHT**

The pallet weight is the combination of the 'self weight' of the timber pallet + 'load'. The load must be distributed across the whole area of the pallet to avoid any potential uneven loading of the rack.

**Do not enter pallets with weights that exceed the permitted limit as indicated on the Dexion Load Signs.**

## **PALLET CONDITION**

Pallets must be in good condition, and free from damage. Pallets with loose or broken boards, or protrusions should NOT be entered into the system.

It is important that the pallet can safely support itself (with load) when spanning between the beam rails.

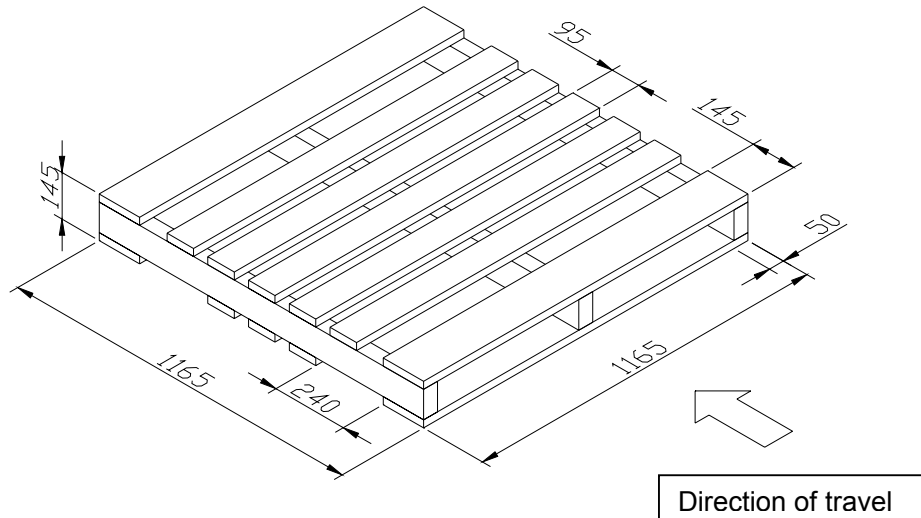
If the strength of the pallet is in question a simple test can be carried out by the customer; support the pallet along its edge (as Deepstor does) a little off the ground and load with 25% overload for at least 24 hours. If the pallet does not deflect more than pallet span/100 after this time it can be considered suitable. Note for the **test**, the load should NOT be banded or shrink wrapped, and consist of small items with suitable gaps in between to avoid any bridging affect.

## **PALLET LOAD STABILITY**

The stability of the load on the pallet is important. Ideally loads will be shrink-wrapped or banded in preference to loose stacking. There should not be any loose wrapping or banding on the bottom of the pallet. Interlocking of individual items is better than an un-structured placement.

Ideally loads should be perpendicular and not lean, however this is rarely practical and the following deviation is acceptable:

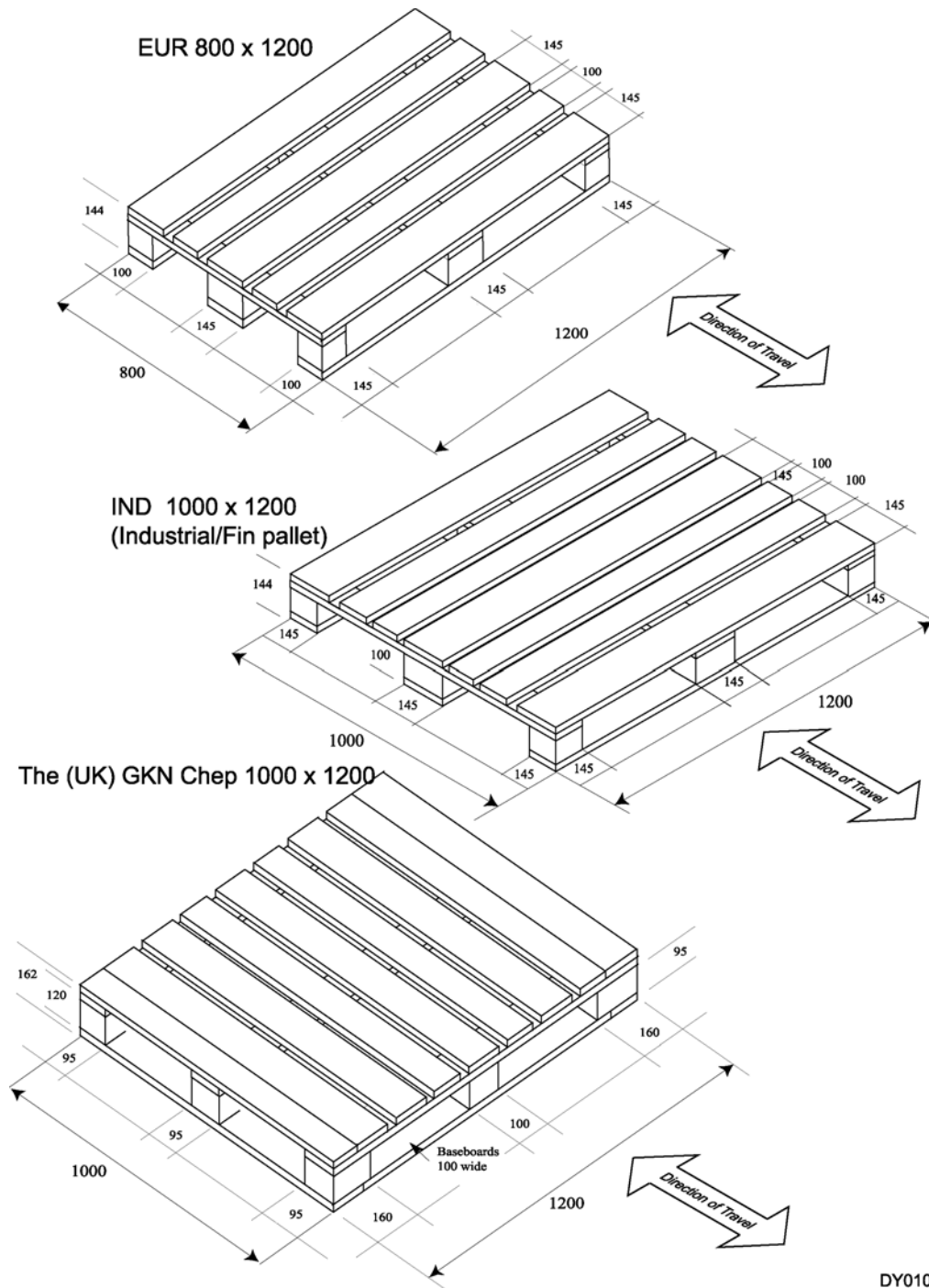
Pallet height up to 2000mm:	Max. 1% of the pallet height.
Pallet height between 2000 and 3000mm:	Max. 20mm.

**PALLET ILLUSTRATION****Australian Chep Wooden Pallet  
(1165x1165x145)**

Pallet Self Weight: 40Kg

Timber: Hardwood.

The Australian standard pallet has a square base of 1165mm (W) x 1165mm (D) with a maximum height (H) of 150mm. The minimum clear entry height between bearers is 90mm. The pallet is a 2-way entry pallet.



DY0101

## THE FORK LIFT TRUCK (FLT)

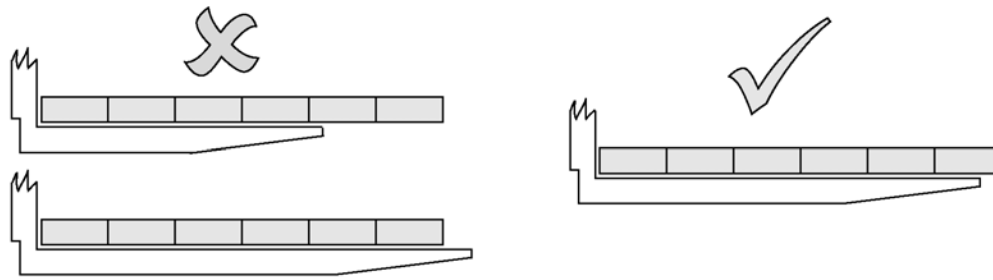
The fork lift truck must be of a suitable design and capacity, capable of lifting the loads to the heights required. If there are any doubts regarding its capacity reference should be made to the relevant manufacturer or supplier.

### LIFT HEIGHT

The truck must be capable of lifting the pallet clear of the top storage level by at least 100mm.

### CORRECT FORK LENGTH

The forks should be of sufficient length to support all the boards, but not extend beyond the pallet (refer to right-hand side figure for correct fork length)



### DRIVER TRAINING

All fork truck drivers should be suitably trained and licensed in the operation of the handling equipment. Secondly they should be trained in the use of this type of storage system and have a copy of these guidelines available to them.

### DAMAGE TO STORAGE EQUIPMENT

The USER is responsible for ensuring that the handling equipment is driven carefully at all times to avoid any collision with or damage to the rack structure

### CARE AND ATTENTION

The following sections of guidelines cover the use of the system, and how to load and unload the racking.

Following these recommendations and procedures, i.e. pallet inspection, correct pallet placement, and alignment will all help the efficiency and smooth operation of the system helping to prevent problems.

Adversely, harsh treatment or abuse will soon lead to damage, and a reduction in system reliability and performance, and in extreme cases render the structure unsafe.

**For the benefit of the system and personnel “Prevention is better than cure”.**

## OPERATIONAL CLEARANCES

### LOAD ON THE PALLET

The load should be stacked centrally on the pallet, and if overhang has been permitted within the design, the overhang should be even on both sides of the pallet.

### LOAD WITHIN THE LANE

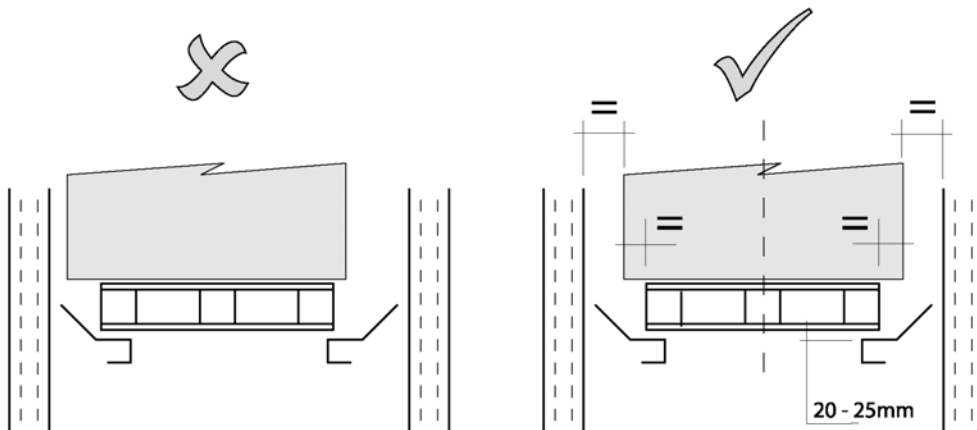
The fork lift truck should deliver the pallet squarely and centrally within the storage lane.

### LOAD BEARING ON THE PALLET RAIL

When the pallet has been lowered onto the pallet rails there must be a minimum of 20mm bearing between pallet and rail.

### DELIVERY CLEARANCE

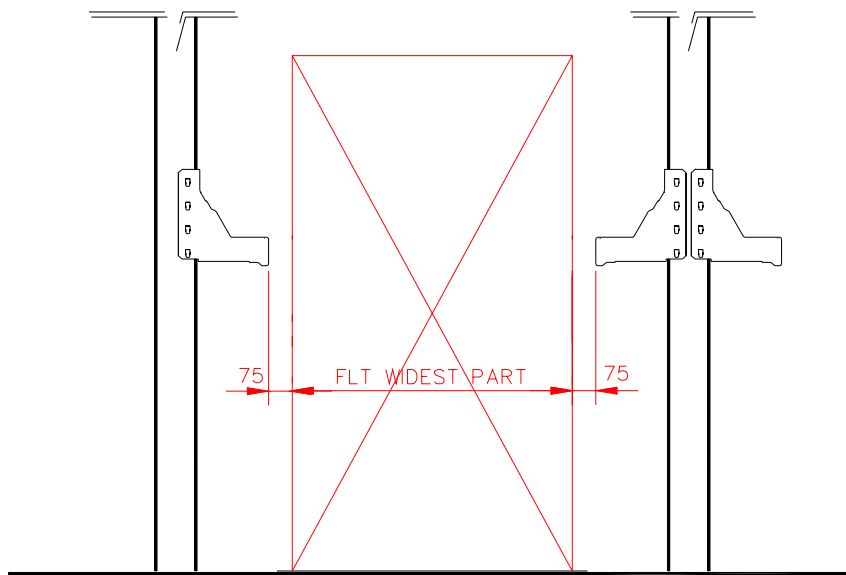
The forklift truck should deliver the pallet clear of the pallet rail by approximately 20 – 25mm.





**FLT CLEARANCE**

To minimize unnecessary forces induced on the rack by a forklift truck during its operation, it is essential that a minimum clearance of 75mm on either side of the widest part of the truck and arm/rail projection be provided. Refer to Operational Clearances for illustration.

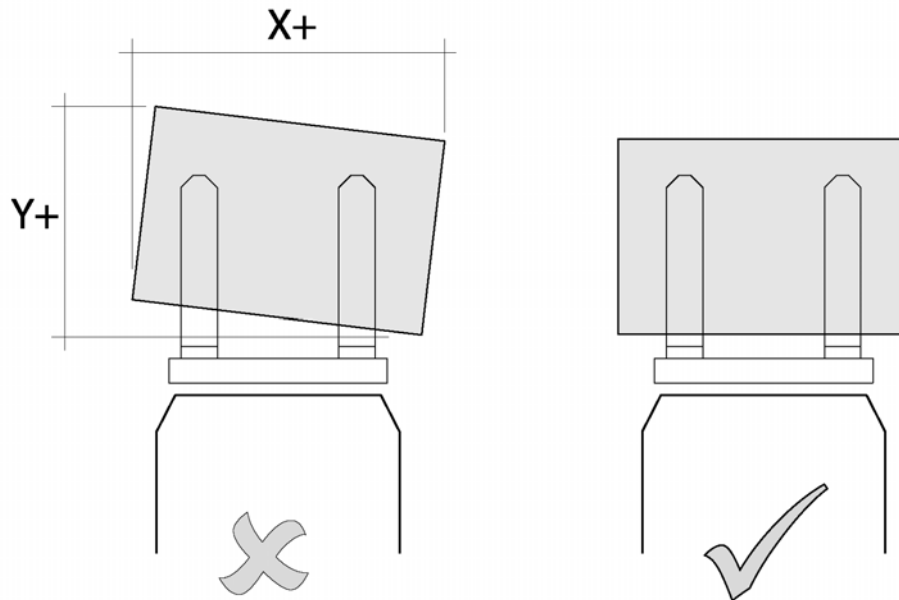


## LOADING / UNLOADING THE SYSTEM

The warehouse should be adequately lit, to permit the safe use of forklift trucks and the handling of pallets.

### PICKING UP THE PALLET

The pallet must be picked up square to the forks, any misalignment of the pallet on the forks can't be corrected during the placement sequence and results in badly placed pallets within the system. Misalignment also increases the effective size of the pallet leading to a reduction in operating clearances.



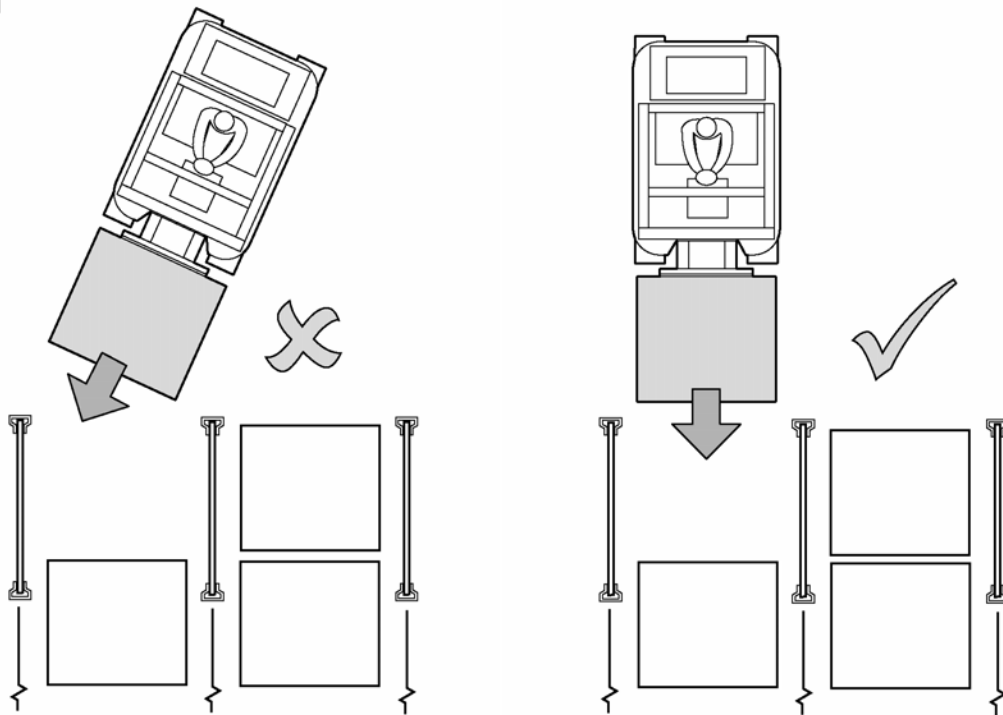
### CORRECT LOADING/UNLOADING PROCEDURE/SEQUENCE

The following pages detail the correct procedures for loading and unloading the racks and the safe sequence for delivering and retrieving loads.

## APPROACHING AND ENTERING THE RACK

The forklift truck should approach the rack squarely and not at an angle. No attempt should be made to deposit/retrieve pallets or to enter a rack when the truck is NOT correctly aligned. It is not acceptable to attempt to re-align a truck after entry into the rack.

0101



## UNACCEPTABLE PALLET HANDLING

It is not acceptable practice to:

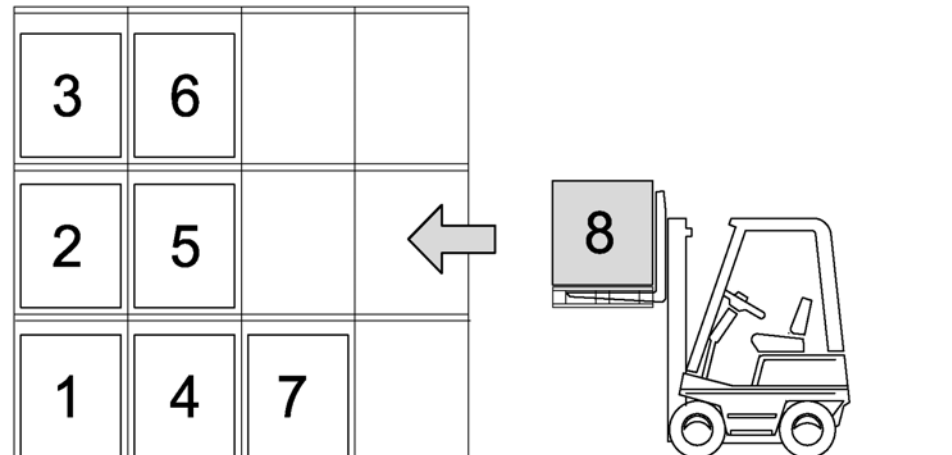
- Nudge one pallet with another, in an attempt to move or re-align loads.
- Drag or slide pallets on or against the pallet rails or structure.
- Position or locate a pallet by nudging the one behind.

All of these are dangerous practices that impart additional loads in the rack structure, and could lead to damage and a reduction in safety.

All are avoidable if the correct procedures are adopted.

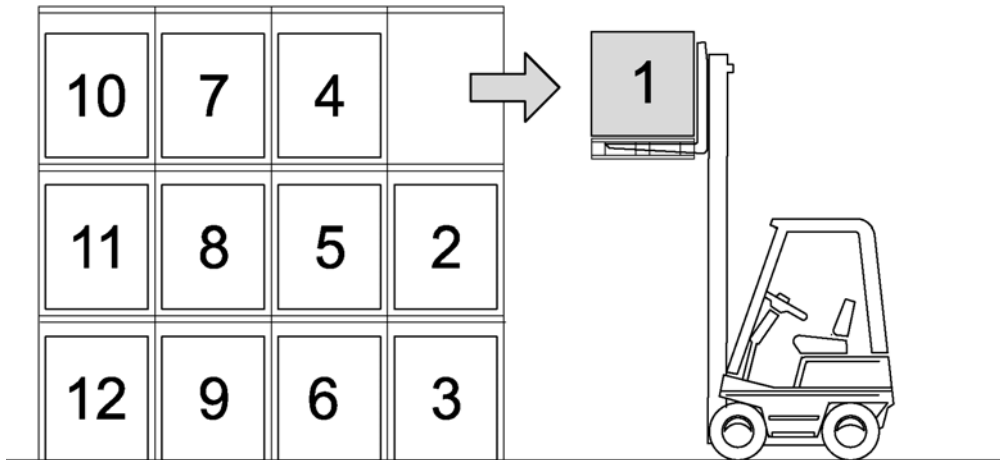
## NEVER WORK BENEATH STORED PALLETS

It is not safe to either work or drive a truck beneath a pallet that is being stored above. Adhering to the correct loading/unloading sequences will prevent these unsafe situations occurring.

**LOADING THE SYSTEM**

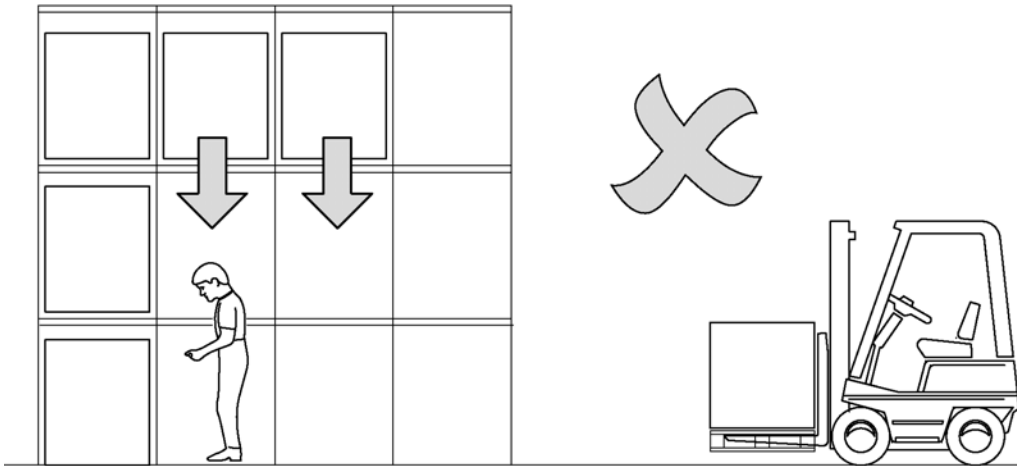
- Step 1** Check that the pallet is the correct style and size for the installation.
- Step 2** Check the underside of the pallet for loose, split or damaged boards. Damaged pallets should not be entered into the racking.
- Step 3** The fork lift truck driver inserts the forks into the pallet, and picks the pallet up ensuring that it is square and that the forks are evenly spaced within the pallet. Any skew in the pallet at this stage cannot be corrected and will remain when the pallet is placed in the rack.
- Step 4** The fork lift truck drives with the pallet, and approaches the rack squarely aligning itself centrally with the desired storage lane.
- Step 5** Slow down and stop the truck at the entrance to the lane. Reduce any tilt on the mast and raise the pallet to the required storage level ensuring the pallet is still central between the pallet rails.
- Step 6** Drive slowly into the storage lane towards the intended storage location, keeping the pallet and truck mast clear of contact with the pallet rails or any other part of the rack structure.
- Step 7** Stop the truck before making contact with previously positioned pallets.
- Step 8** Carefully lower the pallet onto the pallet rails, ensuring no contact with the sides of the pallet rail or the pallet behind. There should be a minimum 20mm bearing on the beam rail.
- Step 9** When the pallet is securely positioned lower the forks until they are free from the pallet and reverse the truck carefully out of the storage lane, checking the aisle is clear.
- Step 10** When clear of the rack lower the forks to just above ground level before driving off.

**Follow the above stacking sequence to avoid potential access beneath stored pallets.**

**UNLOADING THE SYSTEM**

- Step 1** The forklift truck approaches the rack squarely and aligns itself centrally with the desired lane.
- Step 2** Slow down and stop the truck at the entrance to the lane. Reduce any tilt on the mast and raise the forks to the required storage level ensuring the truck is still central between the pallet rails.
- Step 3** Drive slowly into the lane up to the desired pallet location. Stop the truck just clear of the load and adjust the forks if required before entering the pallet.
- Step 4** Lift the pallet clear of the pallet rails, and slowly reverse the truck out of the storage lane ensuring the way is clear.
- Step 5** When clear of the rack lower the forks to the correct travelling position before moving off.

**Follow the above retrieval sequence to avoid potential access beneath stored pallets.**

**SAFETY – NEVER WORK UNDER PALLETS**

**It is unsafe for operators and fork lift trucks to enter a rack beneath pallets that are stored on levels above. This is dangerous and MUST be avoided.**

This situation could occur when the rack has either been loaded or unloaded out of sequence.

The correct sequences are detailed on the previous two pages. Adopting these sequences ensures the racks are loaded progressively in stacks starting with the bottom level at the back of the rack, and then unloaded progressively in stacks starting with the top level at the front of the rack.

Both sequences ensure that there will never be an occasion when a space is created directly beneath a pallet above.

## **CLEANING THE INSTALLATION**

Should the rack need cleaning, either as part of a routine, or as a result of a spillage the following guidelines should be observed.

The clean should comprise of a wipe down with a damp cloth, using (if required) a mild detergent.

**NEVER** use a hose to spray the racking.

**NEVER** use abrasive or caustic cleaning agents.

---

## **ROUTINE INSPECTION / MAINTENANCE**

It is recommended that the end user refer to **Section 9 - “Operation and Maintenance of Adjustable Pallet Racking” of AS4084:1993 (Steel Storage Racking)** for racking inspection and maintenance procedure. As a supplement to the code recommendation, the following information has been compiled based on AS4084:1993 and the FEM recommendation. **FEM (Federation Europeene de la Manutention)** is a European industrial body made up from various national organisations representing the storage equipment manufactures in their own country.

The “Deepstor” system requires no maintenance, other than to repair possible damage through incorrect operation. The system should be regularly inspected.

**Under NO circumstances should any attempt be made to alter the rack structure.**

### **‘RACK SAFETY OFFICER’ / ‘REPORTING PROCEDURE’**

It is recommended that a ‘Rack Safety Officer’ is appointed and a procedure put in place so that any damage or unsafe occurrence can be reported, thus ensuring that any necessary actions can be taken to maintain a safe working environment.

The safety officer would undertake routine inspection, keeping maintenance and safety reports.

### **COLOUR CODING FOR RISK IDENTIFICATION**

The following colour coding; Green, Orange, and Red are classifications of risk as defined by FEM **‘Guidelines for the Safe Use of Static Racking’**

<b>Green Risk</b>	Damage requiring surveillance.
<b>Orange Risk</b>	Hazardous damage requiring action as soon as possible.
<b>Red Risk</b>	Very serious damage requiring immediate action.



## **INSPECTION INTERVALS**

### **Daily Inspections**

This applies to operator care of the system.

Ensure the correct application and use of equipment.

Ensure that the safe working loads are adhered to.

Damaged pallets must not be entered into the system and should be removed as they occur.

Any safety issues or damage to the structure should be reported to the Safety Officer who will carry out the risk assessment and identify the risk as necessary.

### **Weekly Inspections**

The Safety Officer will perform visual inspection carried out from ground level of all the racking.

This should include all forms of accidental damage classed as **Red** or **Orange Risk**.

### **Monthly Inspections**

This should be carried out in a similar manner to the weekly inspection, but include the physical emptying of random bays in order to carry out a more detailed inspection.

It should also be used to check that items already identified as **Red Risk** have been isolated with the necessary actions taken to rectify the risk. Similarly **Orange Risk** items should be checked to ensure repairs are underway.

Ensure that all safe working load signs, maintenance and other safety signs are in place.

### **Six to Twelve Monthly Inspections**

A major inspection by a technically competent person fully experienced in the identification and categorisation of rack damage. Such a person may be an external specialist capable of giving an independent assessment of the racking. This review should also examine the performance of the reporting procedures and that actual repairs are being carried out.

The inspection should be comprehensive and include checking for out-of-plumb and ensure that the rack installation has not been altered. A copy of the load application and configuration drawings shall be retained for this purpose.

The following pages detail the damage assessment procedure and the risk identification using colour-coding method as per FEM.

## **DAMAGE TO THE STORAGE EQUIPMENT**

### **INTRODUCTION**

Almost all damage to pallet racking is a result from a collision by a fork lift truck, or from the pallet the truck is transporting.

Any damage will reduce the ultimate load carrying capacity of the rack to some degree thereby eroding the design safety factors. The greater the damage the greater the reduction in safety factor, until ultimately a collapse could occur at normal working load.

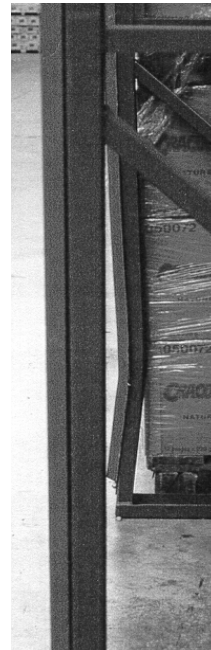
It is important the user is aware of this situation and understands the need to monitor the racking carefully to ensure any damage is identified and dealt with.

The following is a summary of both AS4084:1993 and FEM recommendations. Clearly it is not feasible to reproduce the whole documents in full within these instructions, and therefore if more detail or clarification is required separate reference should be made to those documents.

### **Example of damage**

The following are two examples of damage by a fork lift truck. In both cases the damage resulted in a reduction of about 30% to 40% in load carrying capacity.

Both users should consider themselves very fortunate that neither resulted in a collapse.

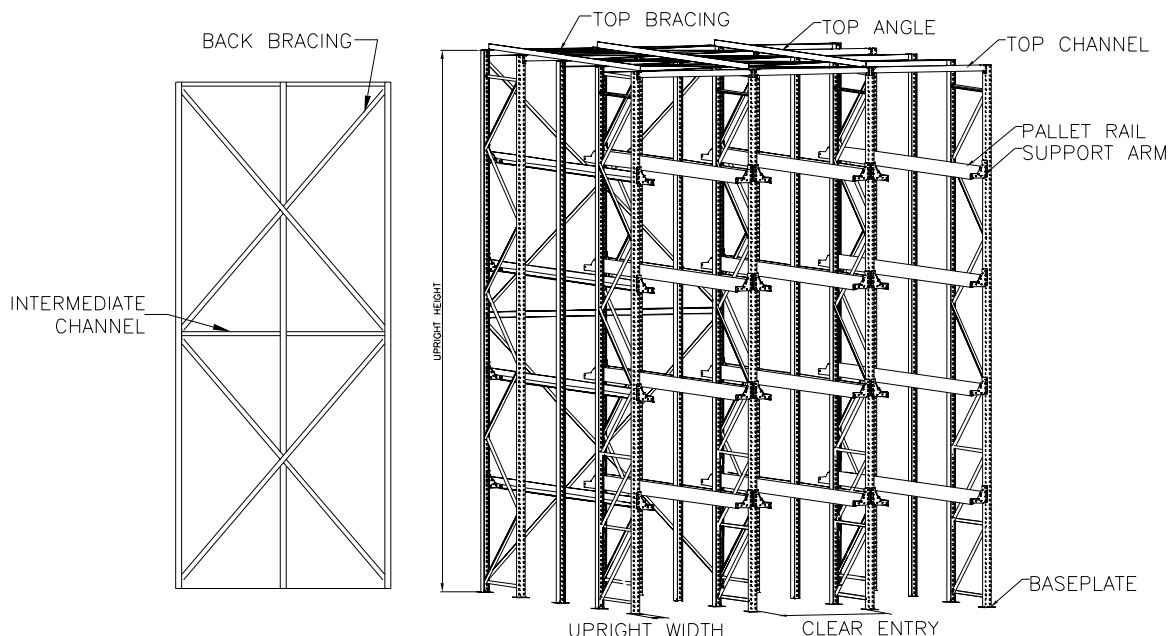


## COMPONENT RECOGNITION

The Deepstor racking installation comprises of the following main elements:

- Load Arm and Automatic Safety Lock
- Pallet Rail and Fixings
- Pallet Rail Splice and Fixing
- Top / Back bracing and Top Channel
- Upright Frames, comprising uprights, bracing and Base plates.

Each should be inspected to the following recommendations.



## REPORT ALL DAMAGE

If the racking is damaged it should be reported immediately to ensure the necessary precautionary actions are taken.

## REPLACE DON'T REPAIR

- Repair of damaged rack components is not recommended.
- Any component no longer fit for use should be replaced on a like for like basis.
- If the bottom portion of an upright is damaged, it is preferred that the whole upright be replaced. However, splicing of uprights is limited to repair work only on intermittent uprights and the splice position must be above 60% of the total upright height and equidistant between rail levels.
- Never apply heat in an attempt to straighten bent components.

## DAMAGE INSPECTION - LOAD ARM AND SAFETY LOCK



### Safety Lock

#### Use

Automatic Safety Lock is located on all Deepstor arms except the front and rear uprights in a lane. Front and rear uprights are to be bolted in position using 1 - M8x16 Nut and Bolt with 1 - M10 large washer.

#### Missing:

Replace immediately

#### Disengagement:

Reposition immediately, when correctly positioned the pin should pass through the lock hole in the arm and through the top of the slot in the upright.

#### Damage upright slot:

The safety lock pin may damage the top of an upright slot if the arm has been raised. If damage has occurred, replace the Safety Lock with 1-M8x16 (Grade 4.6) Nut and Bolt with large washer on the inside of the upright.

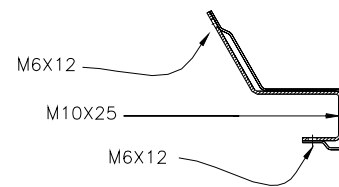
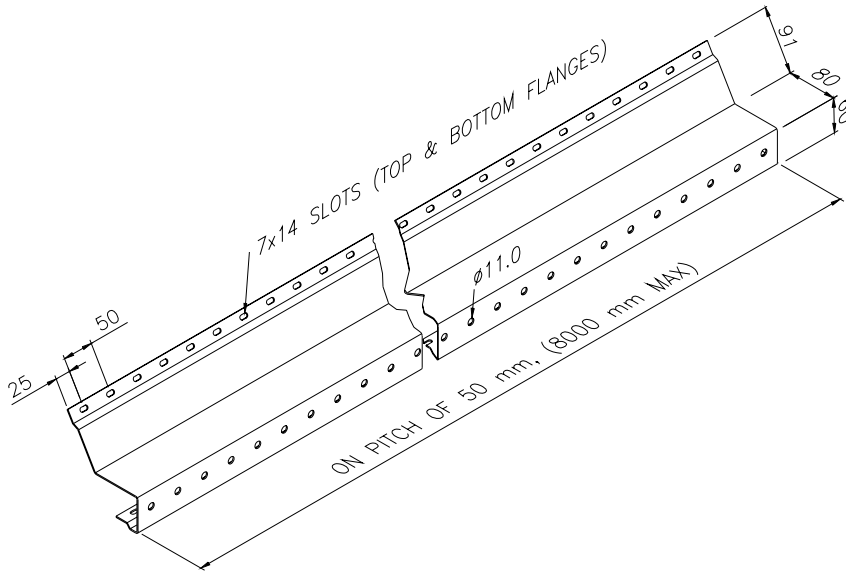
### Load Arm

#### Arm:

Any damage on the arm or tearing and cracking of any hooks, replace the arm immediately. If the slots are also damaged, the entire level of arms and rail may have to be relocated.

**Consult a Dexion representative for rack capacity prior to any level adjustments.**

**DAMAGE INSPECTION – PALLET RAIL**



END VIEW

**Fixing**

Missing:

Replace immediately

Damage to fixing;

Damage to M6 Nut and Bolt by shearing, replace the fixing immediately. When damage on fixing occurs, often, pallet rail is also damaged. If the damage is limited to hole enlargement, replacement with new fixing using a large washer may be adequate. If tearing of the hole occurs, **do not reuse the hole** as repositioning of the fixing hole will be required.

**Rail**

Damage:

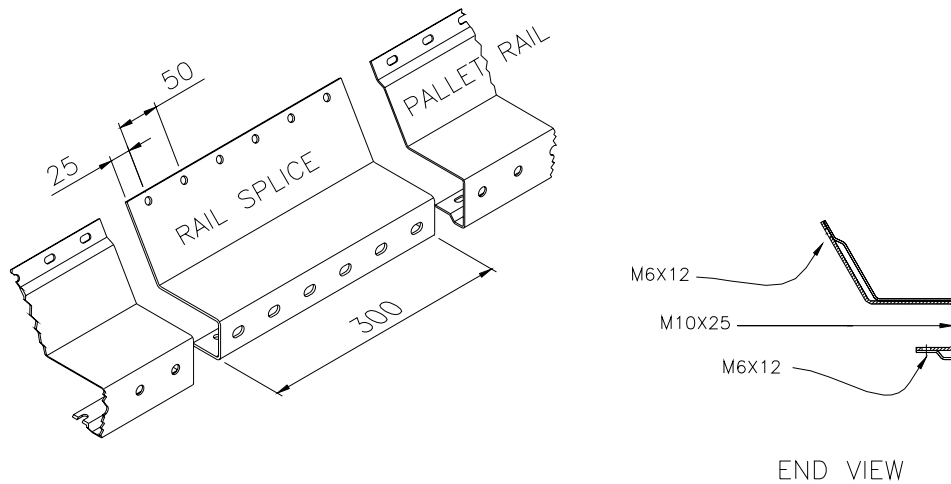
Replace the rail when damage occurs due to buckling, twisting and serious multiple tearing of fixing holes.

Permanent Set:

If the rail is permanently deformed when unloaded it has been overloaded. A straightness tolerance in vertical direction of 1 in 800 is permitted. If the unloaded beam has set more than **SPAN/800**, it must be replaced.

Similarly, a tolerance of **SPAN/500** is permitted in the horizontal direction.

## DAMAGE INSPECTION – RAIL SPLICE & FIXING



### Splice & Fixing

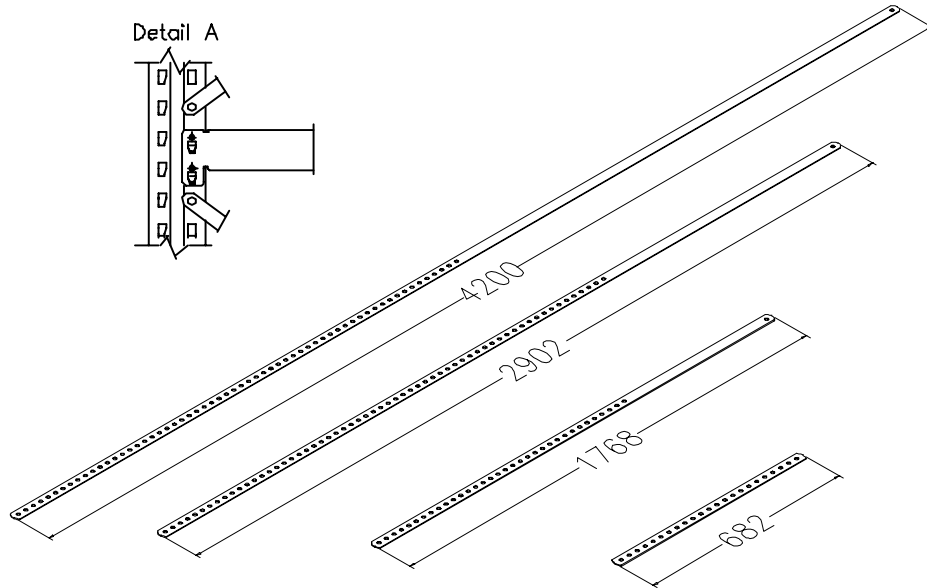
Missing

Replace immediately

Damage to Fixing & Rail:

Damage to M6 or M10 bolts and nuts by shearing, replace the fixing immediately. When damage on fixing occurs, often, the fixing holes on both pallet rail and splice are also damaged. Since the splice is a crucial element in the rail, **it is recommended that the splice be replaced immediately. Note that the rail may also need to be replaced.** If the hole damage is not severe, the joining rails may be swapped so that the undamaged holes may be used at the splice.

**DAMAGE INSPECTION – TOP / BACK BRACING & FIXING**



**Fixing**

Missing: Replace immediately

Damage to fixing; Damage to M10 x 25 Gr 8.8 Nut and Bolt by shearing, replace the fixing immediately. When damage of fixing occurs, most likely either the upright slots or hole on the brace or both are badly damaged. A replacement of damaged brace and upright is recommended.

**Brace**

Looseness; Due to slight impacts or movement of the rack over a period, the brace can become loose. If there is no damage in either the hole or the brace re-adjust the brace and tighten the fixing. Ensure that the rack is plumb.

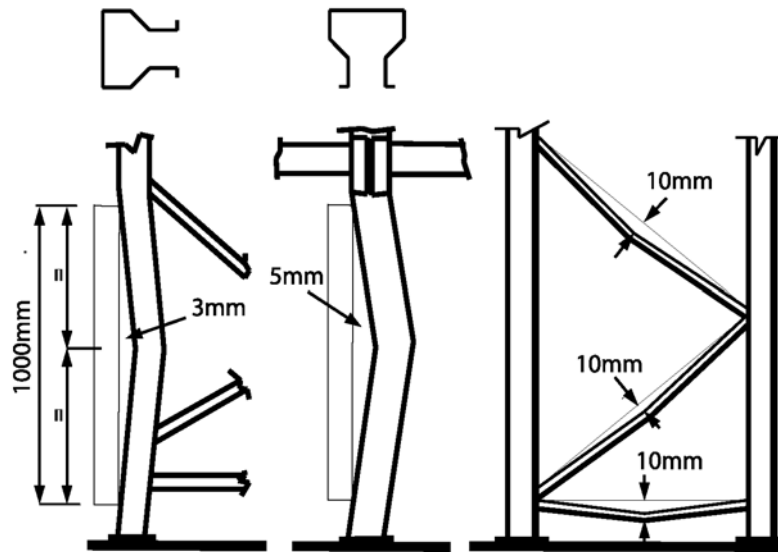
Damage: Tearing of the fixing holes or other damage due to pallet placement (e.g. a permanent kink in the brace) requires replacement of the brace.

## DAMAGE INSPECTION – FRAMES

FEM quantifies damage to frame uprights and bracing as either Green, Orange or Red risk. These rules only apply to damage that produces an overall bend in a component. They do not apply to highly localised damage such as **dents, buckles, tears and splits**. Bends are judged against a 1000mm straight edge, localised bends over a shorter length should be judged pro-rata, i.e. over a half metre length half the limit applies. Members subjected to tears and splits should always be replaced.

### Method of measuring damage:

1. A 1000mm steel straight edge is placed against the flat surface on the concave side of the damaged component such that the damaged area lies equidistant from both ends.
2. For an upright bent in the direction of the rack beams, the maximum gap should not exceed 5mm.
3. For an upright bent in the direction of the frame bracing, the maximum gap should not exceed 3mm.
4. For an upright that has been damaged in both directions, the damage shall be measured and treated separately and the appropriate limits observed.
5. For bracing members bent in either plane, the maximum gap should not exceed 10mm. Pro-rata for bracing members less than 1000mm long.

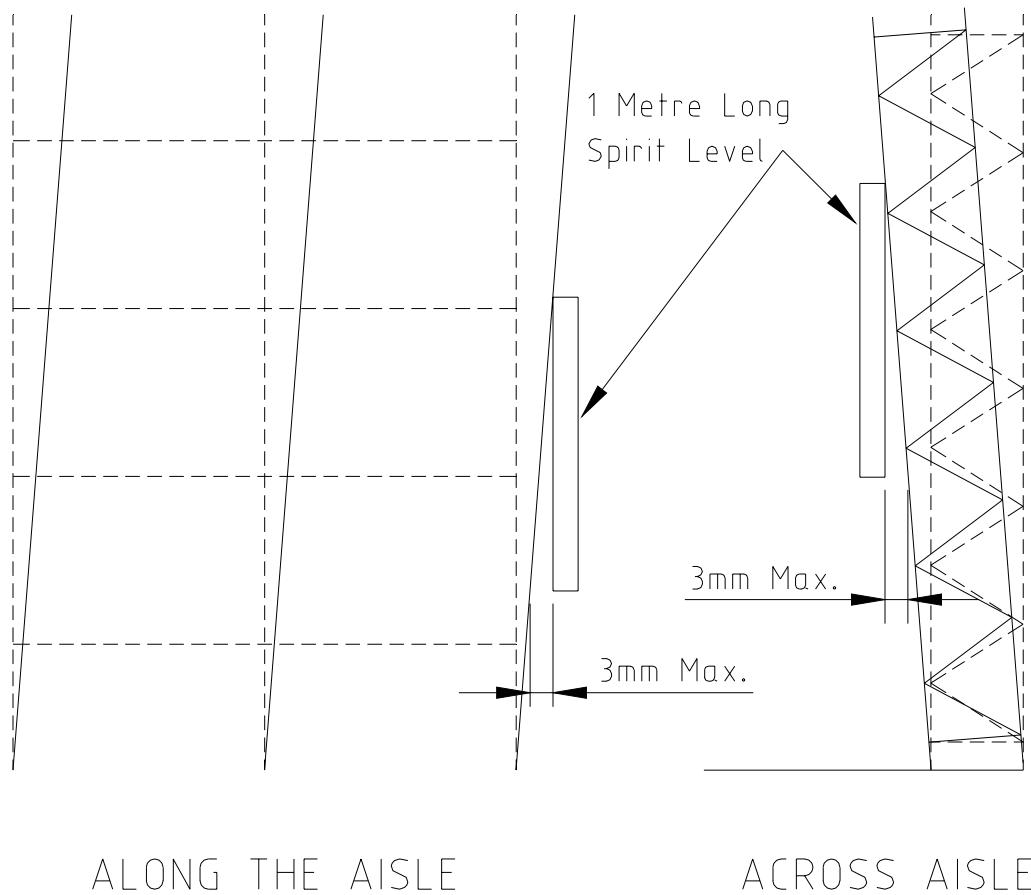




### DAMAGE INSPECTION – RACK OUT-OF-PLUMB

Due to an impact (e.g. fork truck collision), a rack may be out-of-plumb by a certain amount. A recommended maximum amount of out-of-plumb for a rack **in an unloaded condition**, both along the aisle and across the aisle directions, is **Height/350**.

A simple way to measure the amount of out-of-plumb is shown below:



## RISK ASSESSMENT

### GREEN RISK

**Damage requiring surveillance.**

**For damage to frames in which the limits illustrated are not exceeded.**

This would indicate racks where some damage was present but was considered non-critical. Such damaged components should be recorded as suitable for further service until the next management inspection, but clearly identified for further re-examination at future inspections.

### ORANGE RISK

**Hazardous damage requiring action as soon as possible.**

**For damage to frames in which the limits illustrated are exceeded by up to a factor of two.**

This would identify an area where the damage was sufficiently severe to warrant remedial work but not so severe as to warrant the immediate off-loading of the rack. Once the rack is unloaded however, it should not be re-loaded until repairs have been carried out. In the event that the storage position remains full for several days after the initial identification of the problem, the rack should be off-loaded for repair without further delay.

The USER company must have a method of isolating such racks to ensure that they do not come back into use until the necessary repairs have been carried out and the equipment certified as safe. For example, use could be made of dated adhesive labels, which indicate racks that are not to be re-loaded until rectified. In practice any racking with ORANGE RISK category damage should be re-designated RED RISK damage if remedial work has not been carried out within four weeks of the original designation.

### RED RISK

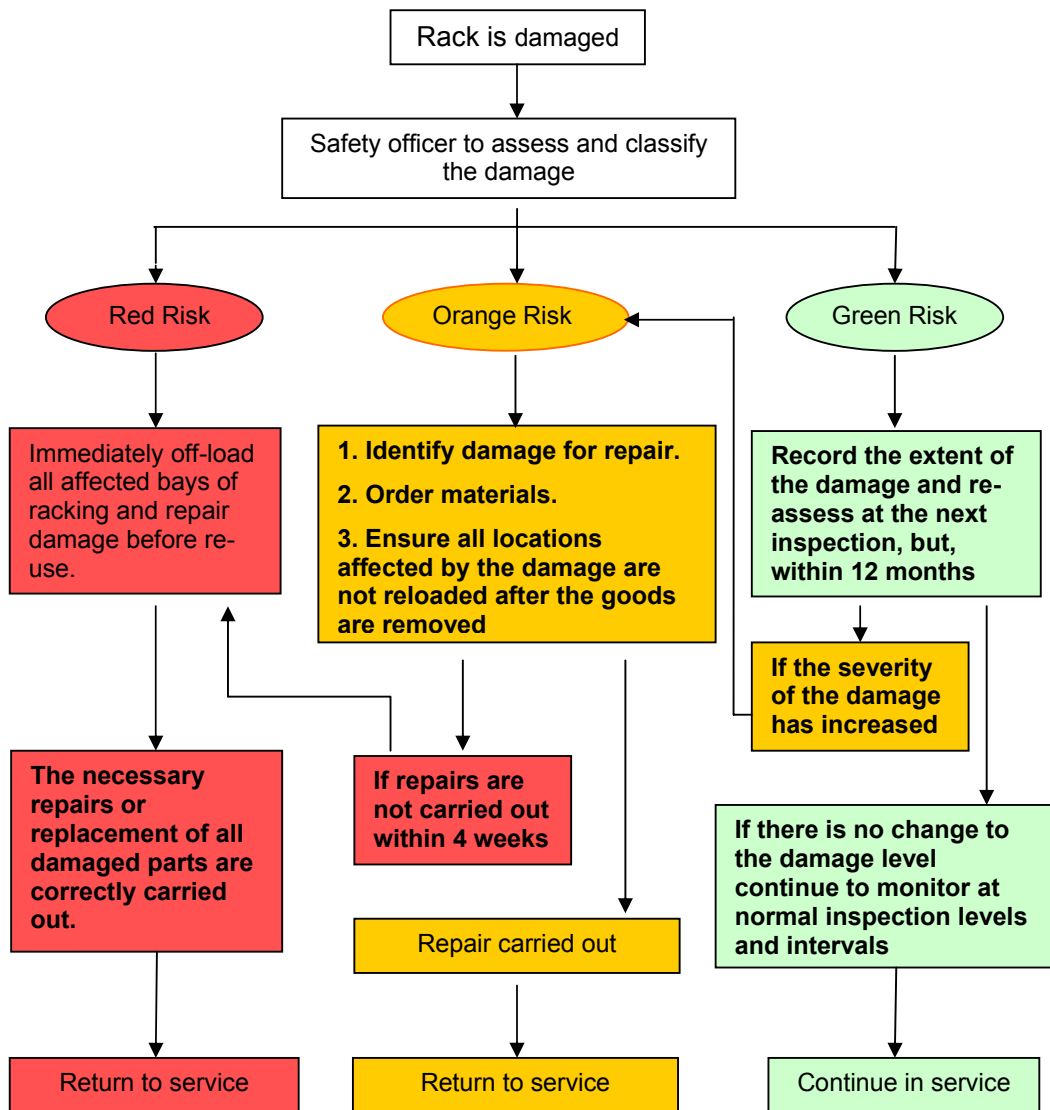
**Very serious damage requiring immediate action.**

**For damage to frames in which the limits illustrated exceed a factor greater than two.**

These are situations where a critical level of damage is identified which warrants an area of racking being immediately off-loaded and isolated from future use until repair work is carried out. Such repair work would involve replacement of the damaged item.

**USER** companies must have a method of isolating areas to ensure that they do not come back into use prior to the repair work being carried out. For example, a particular bay could be off-loaded in the presence of the inspector and roped off to prevent further use.

**DAMAGE ACTION PROCEDURE FLOWCHART**



## TYPICAL CAUSES OF DAMAGE

The following are some typical contributing factors to why damage can occur.

**Handling equipment:** Poor or ill maintained equipment, or a change in the type and size of handling equipment.

**The pallet** Change in the type or size of pallet used, damaged pallets, load overhang affecting operational clearances.

**Truck drivers** Staff, contract or agency drivers, inexperienced or ill-trained, not familiar with the correct operating procedures, working to high throughput quotas.

**Poor housekeeping** Damaged pallets, unstable loads, obstructions within the aisle.

## PRECAUTIONS AGAINST DAMAGE

The following are all factors that can contribute to minimising the risk of potential damage to the racking system.

**Installation layout** The provision of adequate operating aisle and transfer aisle widths. Sufficient operating clearances around the stored pallet.

**Good management** Operational procedures, material flow around the warehouse, avoidance of traffic bottlenecks, reporting procedures, training of warehouse staff.

**Good housekeeping** Inspection of and rejection of unsuitable pallets, clearly defined aisles and stacking areas, maintenance of fork lift trucks, warehouse floor etc. and the provision of adequate lighting. Correctly stacked and stable loads on the pallet.

**Good FLT driver training** Instruction on the correct use of the racking, safety aspects, controlled use of speed within the racking area.

**Good aisle markings** Well defined aisles and transfer aisles, traffic routes, and stacking areas. Floor pallets not to protrude into the operating aisle.

**Provision of guide rail** This may be a consideration depending on the type of racking system.

**Provision of rack protection** Guards for individual uprights or for the whole frame. Protection helps reduce the effects of accidental damage. They are intended as sacrificial protection that needs to be replaced once damaged and ineffective.

BLANK