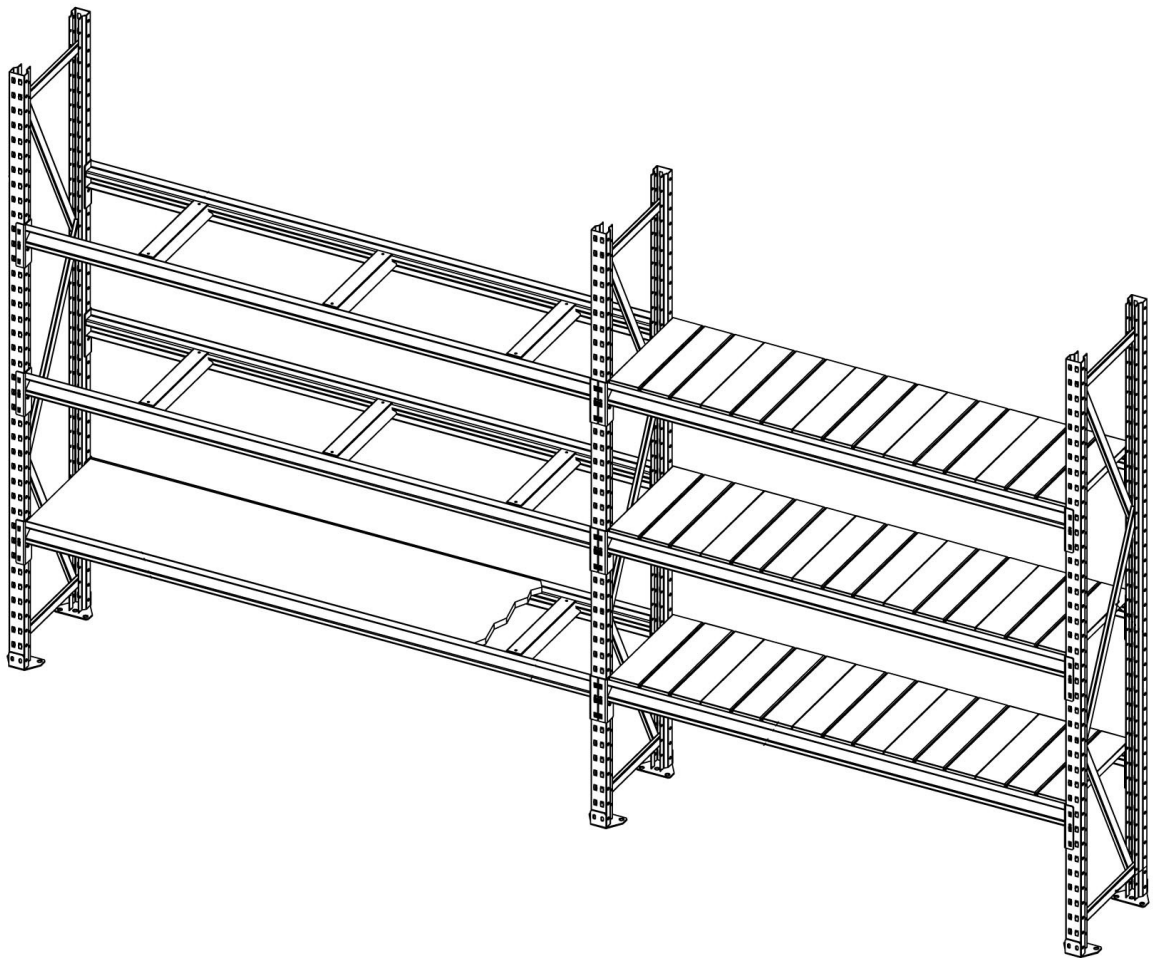


USE AND MAINTENANCE GUIDE LONG SPAN SHELVING



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INTRODUCTION:

Long span shelving is commonly used on those warehouses that need many individual deliveries of non pallet products. Load levels are usually made out of metallic shelves or wood chipboard that can then be divided into smaller areas so that many references can be stored.

This type of shelving is usually integrated on the lower levels of a pallet racking so that pallets can be stored on higher levels and individual deliveries are still available on lower levels.

The use of a conventional shelving installation should be done under some minimum attention requirements in order to avoid accidents that can cause:

- High cost service interruptions.
- Insecure working conditions.
- Damaged products, useless shelves or even environmental problems.

A rational and secure use of the installation is achieved with close collaboration between shelving manufacturers, machine manufacturers, shelving owners and employees. All instructions and recommendations from manufacturers should be strictly followed. It is also strongly recommended to follow any type of planned activity that considers:

- Prevention damaged parts on the shelving.
- Frequent inspection of shelving conditions.
- Employee training.

All information required to prepare planned activities is exposed and explained on further pages. They all comply with **UNE-EN 15635** as regards manually loaded installations, being completely prohibited the loading or unloading with any mechanical aid.

All images shown can just be considered as examples and can never be used as a matter of future complaints.

VERY IMPORTANT! Surveillance, use and installation conditions are customers responsibilities. Customers should advise and train effectively all future workers of the warehouse.

TERMS AND DEFINITIONS:

Accessories: Any external part that can be used to help placing the goods such as a shelf divider.

Gap: Space between frames and beams that can be used to place the goods.

Bracings: Parts installed to reinforce the structure.

Frame: Two uprights bolted with braces and feet.

Allowable loading: beam, frame or shelf load capacity indicated by the storage equipment supplier on the safe load warning notices.

Load per pair of beams: Uniformly distributed load that a pair of beams can support before arriving to their maximum load capacity.

Bay load: Total allowable weight of all the unit loads stored in a bay of racking not including any unit loads that can be stored on the floor.

Foundation: Floor construction on which the equipment is erected and to which it is fixed to provide anchorage and stability.

Specifier: Person or company that provides the supplier with a specification based on the user's requirements.

Clearance: Dimensión between items.

Beam: Item on which the unit loads are placed.

Installer: Trained and qualified person who assembles and builds the racking at the site location.

NOTE: The installer should be trained and experienced in the work to be done and should be properly supervised and controlled to ensure that the health and safety of workers and others is safeguarded.

TÉRMINOS Y DEFINICIONES:

Competent person: Person who by means of a combination of training, experience and education has the knowledge to carry out the task and safety requirements effectively.

Person responsible for storage equipment safety (PRSES): Person appointed by the warehouse management with responsibility for maintaining the safe operation of the warehouse storage system.

Supplier: Company that supplies the storage equipment.

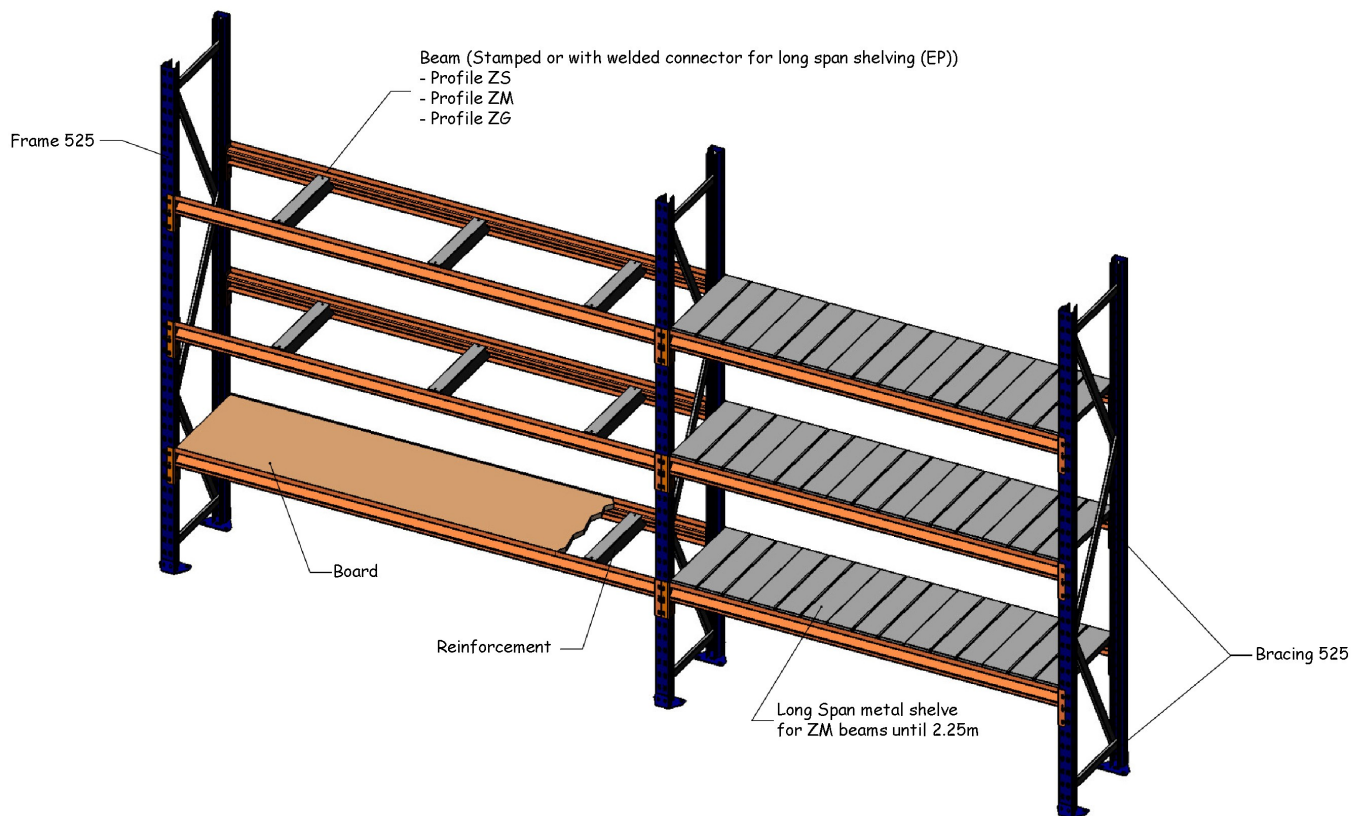
Uprights: Perforated profiles in which the braces are bolted in order to assemble frames.

User: Company or person who manages and operates the installation on a daily basis and is responsible for the continuing safety of the installation.

Unit load: Weight of an individual stored item that can be placed or retrieved in one operation.

NOTE: Maximum manual operation load is 25 kg RD 487/97

LONG SPAN SHELVING ELEMENTS:



ASPECTS OF INSTALLATION WORK TO BE OBSERVED:

All storage equipment shall be fixed to the floor to prevent movement of the uprights where mechanical handling equipment is used at or near to the storage equipment. The number and type of floor fixings shall be specified by the storage equipment supplier and these shall be installed in accordance with the instructions of the fixing supplier.

Single run, single tier hand loaded shelving systems without drawers and with a height of less than 2.5 metres or single tier double runs less than 4.0 metres in height, need not comply with the requirement regarding floor fixings if the ratio between height to topmost loaded shelf and overall depth is less than 4:1.

When upright frames used for APR are coupled back to back in double runs at least two run spacers shall be provided. The position of the run spacer shall be as near as possible to a bracing node point to prevent local upright damage by bending if there is a truck impact or a frame is damaged by other means. The number and location of the row spacers shall comply with the following minimum requirements:

- 1) Lower run spacer; Next to the second lowest horizontal bracing, and in the absence of horizontals next to the second lowest bracing joint (see figure 1)
- 2) Upper run spacer; next to the highest horizontal bracing member adjacent to a diagonal (see figure 1)
- 3) If applicable, a run spacer adjacent to a splice on spliced uprights.
- 4) If the minimum requirement of two run spacers is fitted, the optimum positions are shown in figure 1.

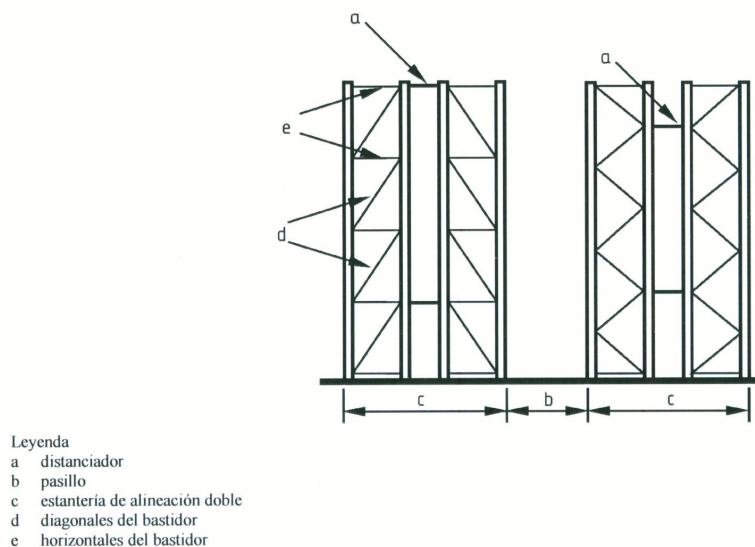


Figura 1 – Situación de los distanciadores

ASPECTS OF INSTALLATION WORK TO BE OBSERVED:

Back or spine braced bays of racking or shelving provided for longitudinal (down aisle) stability shall be installed and anchored to the floor in accordance with the supplier's requirements. Bracing, when supplied, shall be installed in accordance with the manufacturer's instructions at all specified positions and shall not be removed or repositioned.

Base plates shall be in contact under their entire area with the floor of the building or any prepared plinth. The base plates shall be packed up with suitable Steel shimming or grouting under the whole of the plan area of the base plate. Steel shims should be permanently located under the base plates to fulfil a similar function. Specialists in this type of operation shall carry the grouting.

Spacing of beams, cantilevers, shelving, etc shall not be greater than values given by the rack supplier that correspond to their maximum loads or the maximum allowable load on the upright frame as shown on the safe load warning notice.

Beams shall be locked in position as prescribed by the rack supplier.

Safe load warning notices shall be in position.

CHANGES TO THE STORAGE EQUIPMENT CONFIGURATION:

Changes in the safe carrying capacity can occur when the storage equipment is modified. In all cases of changes the supplier or an appropriate expert shall be consulted and any advice received shall be followed before any alterations are made.

- A) Rack shall be unloaded prior to carrying out the alterations.
- B) Additions or changes to the storage equipment by welding or bolting shall not be allowed unless specifically approved by the equipment supplier.
- C) Safe load warning notices shall be updated as necessary after all changes to rack configuration..

IMPORTANT DATA RELEVANT TO THE USER:

In order to ensure safe use of storage equipment:

- A) Storage equipment shall be built in accordance with the specification, plans and the detailed instructions for assembly provided by the supplier. Where the user constructs the installation, it shall comply with the installation instructions of the supplier.
- B) Building floor shall have a degree of strength, stiffness, surface levelness and flatness suitable for operational purposes.
- C) In order to instruct the user of the system, a printed load warning notice shall be provided by the supplier giving sufficient loading information on the equipment and shall be permanently displayed by the user on, or adjacent to, the racking or shelving.
- D) User management procedure shall ensure that the maximum load conditions stated on the notice are not exceeded. The procedure shall also ensure that the quality and type of LMA to be used is suitable for the storage equipment.
- E) Method of operation shall be in accordance with the supplier's instructions.
- F) Load placement should always be done starting on the beam ends and finishing on the center of the beams. Always placing loads uniformly. Always use lower levels for the heavier unit loads and higher levels for lighter unit loads.

GENERAL SECURITY:

Person responsible for storage equipment safety (PRSES);

The user shall appoint a person responsible for storage equipment safety and the name of that person should be publicized to the warehouse staff. The PRSES shall be instructed to identify the supplier of storage equipment, contact the supplier and identify the training necessary to keep the storage equipment in a safe working condition.

The PRSES shall be aware of the nature of the operations in the warehouse and the associated dangers on the basis of a risk assessment, as well as the precautions that are taken to prevent or limit the dangers, by means of instructions and/or signs.

Safe load warning notices;

Instructions with regard to the safe load capacity shall be displayed in a prominent location on or adjacent to the storage equipment so that they are clearly visible, in the national language and in a durable format. Where necessary, the instructions should be displayed in such way that persons with inadequate knowledge of the national language could also understand them. The safe load capacity of storage equipment is based on good practice in the placement and retrieval of unit loads.

Acces to storage levels;

Safe access equipment shall be used for gaining access to storage levels above ground level. Standing or climbing on the racking shelving shall not be allowed.

Risks;

Heavy duty machinery should not be used on long span shelving, therefore risks are much lower than on a conventional pallet racking installation. Light duty machinery can be used and we should consider:

A) Partial or total load fall, due to:

- Load placement errors
- Packaging defects
- Load level configuration changes.
- Using different unit loads than specified causing beam overloads.
- Installation or modification without correct guidance.

GENERAL SECURITY:

- Crashing against shelving.
- Inadequate or inexact design

B) Traffic accidents:

Mainly caused due to poor signaling, illumination, inadequate aisles or speeding.

Training;

All warehouse workers should be adequately trained in order to comply with the safe use of the shelving installations.

ANOMALIES AND ERROS. COMMON RISKS:

Next table shows common risks, their effects on shelving and how to avoid them.

On Beams:

ANOMALIES AND ERRORS	CONSECUENCES	ADVICE
Overload	Excesive deflection. Vertical distortion. Possible unit load fall.	Unit load weight revision
Non-uniformly loaded	Excesive deflection. Vertical distortion. Possible unit load fall.	Follow EN-15635
Abrupt loading	Excesive deflection.	Unit load loading/unloading training
Absence of security pin	Possible beam fall	Installing security pins
Machinery accidents	Excesive deflection. Possible beam fall.	Follow EN-15635
Oxidation or loss of paint	Lifespan loss. Possible beam fall.	Follow maintenance programs to avoid corrosion.

On Frames:

ANOMALIES AND ERRORS	CONSECUENCES	ADVICE
Overload	Excesive deflection. Vertical distortion. Possible unit load fall.	Unit load weight revision
Machinery accidents	Dents (fig.19) Permanent deformation on uprights (fig.17) Permanent deformation on profiles(fig. 18) Profile burst (fig. 20)	Follow EN-15635

ANOMALIES AND ERRORS. COMMON RISKS:

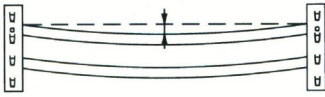


Fig. 13 - Vertical deflection in a beam

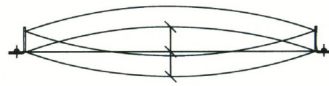


Fig. 14 - Horizontal deflection in a beam

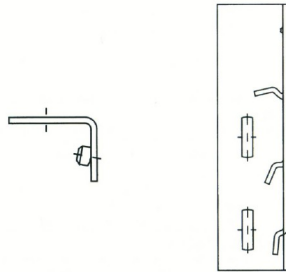
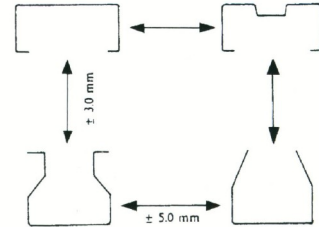


Fig. 15 - Connector. Deformation and broken nail

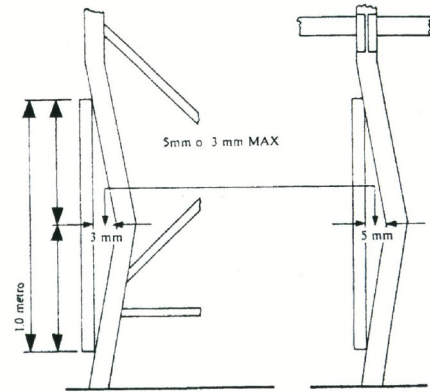


Fig. 17 - Deformation and buckling in uprights

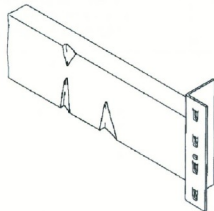


Fig. 16 - Dent beam

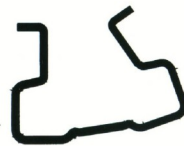


Fig. 18 - Upright deformation

INSPECTION OF STORAGE EQUIPMENT:

GENERAL:

Storage equipment shall be checked regularly for safety and specifically for any damage that has occurred. Repairs shall be carried out in a timely and effective manner with due regard for the ongoing safety of the system since this is the basis of the design. Records shall be maintained of all damage or other safety problems found and evaluations carried out as part of a damage reduction procedure.

The main structural issues for inspection shall be;

- Impact damage to any part of the structure, particularly upright and beam damage.
- Out of verticality of the uprights
- Condition and effectiveness of all components particularly base plate and beam to upright connections.
- Crack in welds or parent material
- Conditions of the floor of the building
- Positions of the loads on the shelves
- Rack is built in accordance with installation instructions.

Other safety items that should be checked are:

- Load and information notices are present and up to date.
- No storage positions are overloaded.
- Stability and dimensions of the unit loads are satisfactory

The inspection of all storage equipment should be done systematically on a regular basis and is normally carried out from ground level, which is where most of the damage tends to occur unless there are indications of problems that need investigation. If it is necessary to carry out a high level inspection then a safe method of access shall be used in order to carry out the inspection.

As soon as safety problems or damage is observed by any person it shall be immediately be reported to the PRSES. All persons shall be therefore receive formal instruction on the safe operation of their system affecting their safety and the safety of others.

The PRSES shall ensure that inspections are made at weekly or other regular intervals based on a risk assessment. A formal written record shall be maintained.

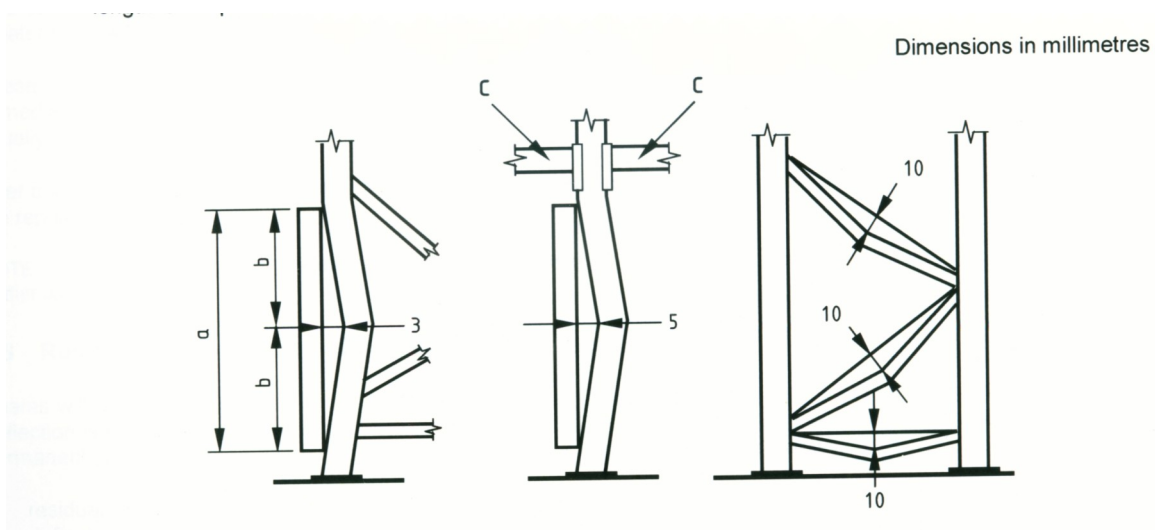
A technically competent person shall carry out inspections at intervals of not more than 12 months. A written report shall be submitted to the PRSES with observations and proposals for any action necessary.

MANITENANCE AND INSPECTIONS:

DAMAGE EVALUATION CRITERIA;

These rules apply only to damage that produces an overall bend in a member (see fig.14) They do not apply to highly localized damage such as dents, buckles, tears and splits. Localized bends over a length of less than one metre may be judged pro rata to the 1,0 m limits, e.g. over a half metre length half the prescribed limits apply. Members subjected to tears and splits should always be replaced. Measurement of damage shall be carried out as follows:

- A) Straight edge 1,0 m long is placed in contact with a flat surface on the concave side of the damaged member such that the damaged area lies central, as near as possible, to the length of the straight side.
- B) For an upright bent in the direction of the rack beam spans, the maximum gap between the upright and straight edge shall not exceed 5,0 mm.
- C) For an upright bent in the plane of the frame bracing, the maximum gap between the upright and straight edge shall not exceed 3,0 mm.
- D) For an upright that has been damaged such that there is a simultaneous bend in both longitudinal and lateral directions the left-to-right and front-to-back deformation shall be measured and treated separately and the appropriate 5,0 mm and 3,0 mm limits observed.
- E) For bracing members bent in either plane, the gap between the straight edge and the bracing member shall not exceed 10,0 mm over a 1.0 m gauge length or pro data for shorter bracings where a 1,0 m gauge length is not practical.



MAINTENANCE AND INSPECTIONS:

DAMAGE EVALUATION CRITERIA;

Damages on beams:

A beam shall be deemed overloaded if permanent deformation has occurred or if the deflection is more than the specified deflection. Deflection limits for beams are $L/200$.

The presence of the necessary locking devices shall be checked during inspection and repair. Any missing locking devices shall be replaced immediately to prevent accidental dislodging of beams. A supply of beam locking devices shall be held in stock on site.

Clasification of damage to uprights and bracings;

GREEN LEVEL: This category relates to cases where the limits of figure 14 are not exceeded. Green level indicates the limit that does not require a reduction in the rack carrying capacity as stated on the load notice or require repair of the system. This would indicate components of racking that are considered to be safe and serviceable. Such components shall be recorded as suitable for further service until the next management inspection but shall be clearly identified for specific re-examination and re-assessment at future inspections. Exceeding the Green level causes risk to the racking system.

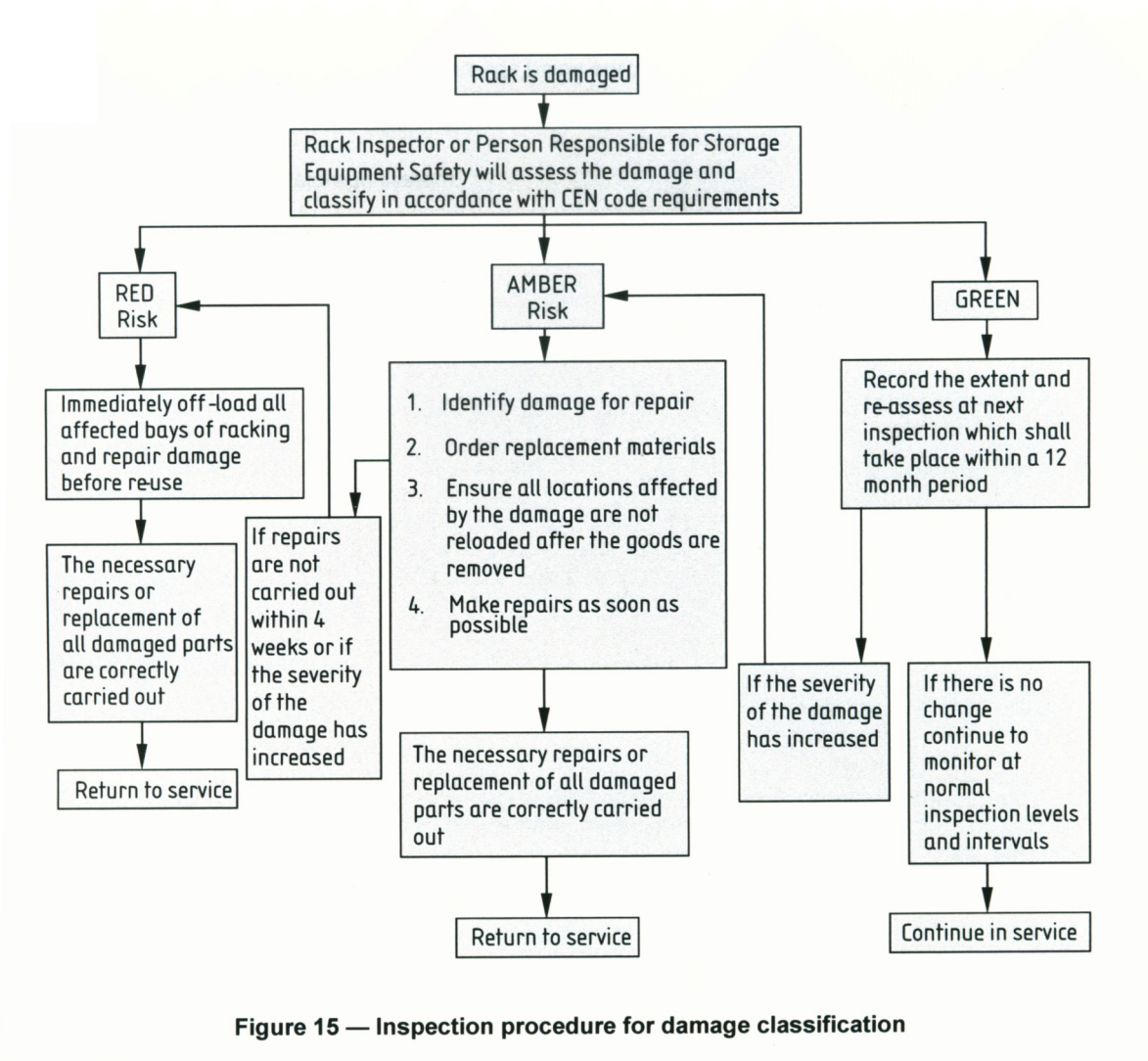
AMBER RISK: This category relates to damage in which the damage limits of figure 14 are exceeded by a factor of less than two and shall result in the replacement of the damaged component. This would identify an area where the damage is sufficiently severe to warrant remedial work but not so severe as to warrant the immediately off-loading of the rack. Once the load is removed from a damaged component, the component should be replaced before reloading.

RED RISK: This category relates to damage in which the damage limits of figure 14 are exceeded by a factor equal or 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.

MAINTENANCE AND INSPECTIONS:

DAMAGE EVALUATION CRITERIA;

FIGURE 15— INSPECTION PROCEDURE FOR DAMAGE CLASIFICACION



Recycled Shelving:

All changes or modifications to the shelving shall be informed to Kimer estanterías before being made. Any modification can affect loading capacities of the shelving parts and therefore the manufacturer should be advised in order to carry out an examination to be sure all parts are able to be reused.

ANNEX A : SUPPLIER´S RESPONSIBILITIES (INFORMATIVE)

The supplier should:

- A) Specify the technical limitations of the system in terms of its safe operating conditions and carrying capacity in the light of the specifier´s requirement (see EN 15629). This may be done by the provision of a drawing detailing dimensions and the position of the racking with clearances and operating aisle widths shown. This will identify any specific features of the system such as imposed loadas or non standard operting conditions, which heva been incorporated into the design. Any load accesories provided will be identified.
- B) Identify what rack protetion equipment should be provided.
- C) Provide, if required, an installation service by a team of trained and experienced installers working under qualified supervision. This should include a formal post-installation check of the racking on completion of installation by a competent person and a formal handover certificate signed by a competent person presented to the client confirming that the work has been completed to the specified standard.
- D) Specify the imposed loads due to the storage equipment of the warehouse floor.
- E) Provide ongoing technical advice to the user of the racking particularly relating to the effects of change of use, change of load, or reconfiguration of the rack geometry to suit new requirements.
- F) Provide advice to the user of the rack on the need for regular scheduled inspection routines and a formal maintenance programme to deal with any accidental damage that occurs.
- G) Make available for purchase replacement components to allow effective repair and maintenance of the racking.
- H) Supply load warning notices in approved safety colours providing information on the limitations of the system.
- I) Provide information to the user on the safe use of the equipment.

ANNEX B—EXAMPLE OF TYPICAL LOAD WARNING NOTICE (informative)



Conduct regular inspections to check for:
 - Correct application and use;
 - Loads within allowable safe limits;
 - Accidental damages or dislodgement of structural components



REPORT ALL DAMAGES TO THE 'PERSON RESPONSIBLE FOR STORAGE EQUIPMENT SAFETY'



Do not alter the structure without either:
 - checking effects against manufacturers 'technical data', or;
 - obtaining approval from supplier



DO NOT CLIMB RACKING

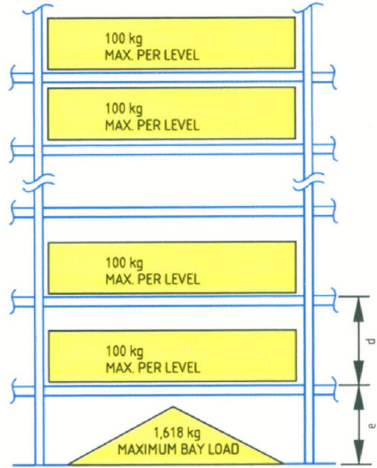


Refer to 'EN15635: Steel static storage systems - Application and maintenance of storage equipment'



If in doubt
ALWAYS
 contact supplier

Date of delivery	Project ref.
___/___/___	_____



All loads To Be Uniformly Distributed

Rack supplied by:

KIMER
creamos espacio 