

Foreword

"We all have a duty to care for the safety of ourselves, our working colleagues and members of the public. This duty is particularly important in the warehousing industry where everyone needs to be safety conscious."

It is frequently said by safety officers that accidents do not just happen, they are caused. This applies to the whole of industry where accidents are often the result of people not thinking or anticipating what others might do and, in some cases, through ignorance or negligence which is unforgivable. We all have a duty to care for the safety of ourselves, our working colleagues and members of the public. This duty is particularly important in the warehousing industry where everyone needs to be safety-conscious.

The Health & Safety at Work act has been with us for many years in the UK but, following a European Commission initiative, six new pieces of legislation, commonly called "The Six Pack", were introduced in the UK. These requirements amplify the provisions of the Health & Safety at Work Act and clarify many of the precautions, which should be taken.

This Guide is one method of prompting positive action to ensure the workplace is made safer and will be of interest to employees, line managers and board directors in checking that their warehouses meet the required safety standards. The Guide is easy to follow and takes the reader step-by-step through the key safety issues and will make a valuable contribution to the improvement of safe storage practices in warehouses and other storage areas.

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INTRODUCTION

There are over 1000 accidents a year in the UK storage and transport services, costing the economy, employers and employees millions of pounds in lost working days and lost revenue. The principal causes of these accidents can be seen in Table 1.

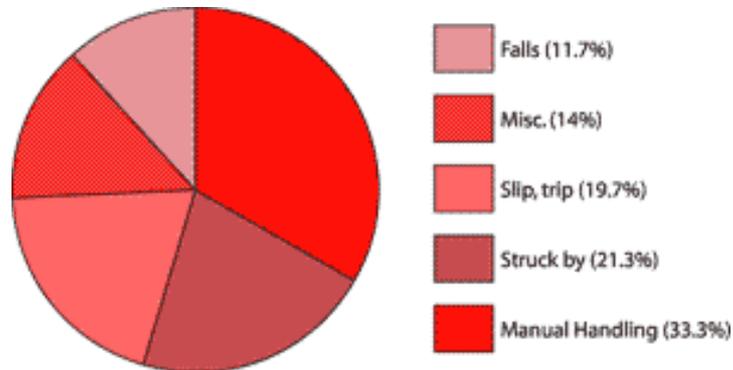


Table 1. Causes of Accidents
Source: Injuries to Employees 1992/3. HSE

Numerous Acts of Parliament, regulations and guidelines, including the CS 'Six Pack', exist to ensure that companies, organisations and individuals minimise the opportunities for accidents to happen. However, many employers **and employees** are still unaware of legislative requirements or best practice methods. Even when they are aware of these many do not understand them or the impact they have on their own organisation or job.

Dexion, a British Safety Council Award holder, has compiled this **Guide to Safe Storage**, based on its knowledge and expertise within this environment, to assist all those involved in the storage and retrieval of goods. It confines itself, however, to those aspects of storage and handling with which Dexion is directly associated.

Unless you are 100% sure that you have a totally safe working environment we suggest you read on.

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1. What Are My Responsibilities?

(Ref.: Health & Safety at Work Act 1974)

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

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

It is the responsibility of every member of an organisation 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.**

The result if a company or its employees are found guilty of not demonstrating duty of care, of non-compliance or negligence, is prosecution by a magistrate with a maximum fine of £20,000 and six months imprisonment. Crown Courts have the power to impose limitless fines and up to two years imprisonment for certain offences.

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

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

Whilst this Guide is primarily aimed at storage facilities typically associated with warehouse, it is important to note that the Health & Safety at Work Act also applies to:

- **All workplaces, both old and new; and**
- **Shops, offices, stores and factories**

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2. What Environmental Elements Need To Be Considered?

(Ref.: Health & Safety in Retail & Wholesale Warehouses 1992)

Can you honestly answer yes to the following questions?

<i>Layout of Storage Areas</i>	Yes	No
All hazards have been identified and risks assessed		
People and vehicles are segregated as far as possible.		
One way systems 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 all automated areas is strictly controlled.		
All workstations are adequately protected.		
Rack uprights and rack ends are all adequately protected.		
Protective equipment is of the correct duty and is correctly fitted and maintained.		
All loads and stacks are stable.		
<i>Floors</i>		
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 load-bearing capacities.		
Where personnel are allowed access to mezzanine floors all openings and edges are guarded.		
All floors are flat, level and free from holes.		
Removable guard sections on mezzanine floors for use by lift trucks are prohibited. (BS 5395 Part 3 states that removable guard sections are not permitted and that self-closing gates must be fitted)		

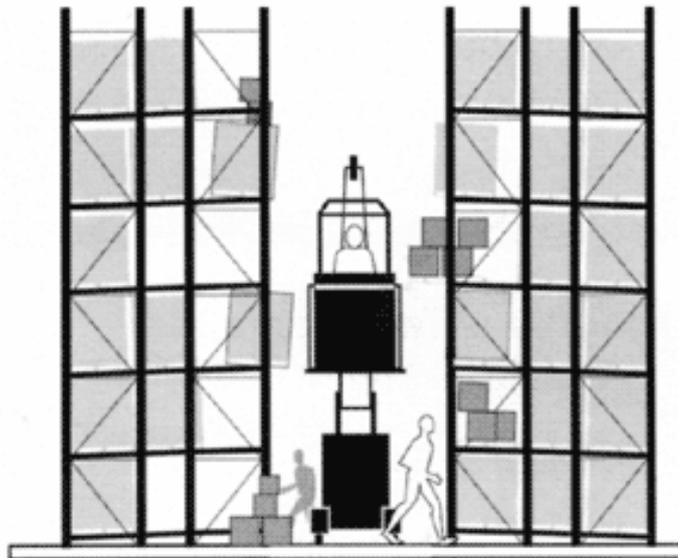


Fig 1. An Unsafe Warehouse

Heating	Yes	No
All storage areas are maintained at reasonable working temperatures (this obviously does not apply to cold stores).		
Where this is not possible there is an area available near-by for employees to warm-up.		
Lighting		
Lighting is sufficient to maintain safe and workable conditions.		
General Housekeeping		
Aisles are always clear.		
Stock does not project from a rack or shelf and does not 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 are 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 possible risks. Reputable storage manufacturers and specialist companies can carry out rack safety surveys on your behalf.

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3. How Can Training Help?

(Ref.: Health & Safety in Retail and Wholesale Warehouses 1992)

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 equipment is to be used?**
- **How does this equipment work?**
- **What dangers are associated with its use?**
- **What safety precautions are needed?**
- **How can equipment be cleaned safely?**
- **Are preventative maintenance and inspection programmes 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.

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4. What Do I Need To Know Before Purchasing New Storage Systems?

(Ref.: Health & Safety in Retail and Wholesale Warehouses 1992)

Whilst reputable suppliers of storage equipment will visit the premises to carry out their own appraisal you may find the following checklist useful. (Tick the sections once completed).

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 (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 i.e. anti-collapse system		

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

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5. Are Second-Hand Storage Systems Safe?

(Ref.: Health & Safety in Retail and Wholesale Warehouses 1992)

The Health & Safety in Retail and Wholesale Warehouses document 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 good**

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1. What Are The Key Elements Associated With Racking?

(Ref.: Recommended Practice for the Use of Static Racking SEMA 1989)

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 "proved" by structural calculations?
- Are double-sided runs connected and spaced using appropriate run spacers?
- Is the racking fixed securely to the floor?
- Are the aisles wide enough that mechanical handling equipment can be easily manoeuvred?
- Are beam connector locks securely fixed at both ends of the beam?
- Are the correct 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).

If in doubt about any of these points consult the manufacturer of the equipment or an authorised distributor.

Maximum Loading

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



Fig. 2 Maximum Load Notice

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

Stability

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

- The height-to-depth ratio; and
- 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 and 10:1 all uprights need to be secured.

If the 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 floor fixings loose?
- Is the racking as stable as it should be?

Calculate your height-to-depth ratio:

$$\frac{\text{X (Height to top beam in metres)}}{\text{Y (Depth of rack in metres)}} = \text{Ratio:1}$$

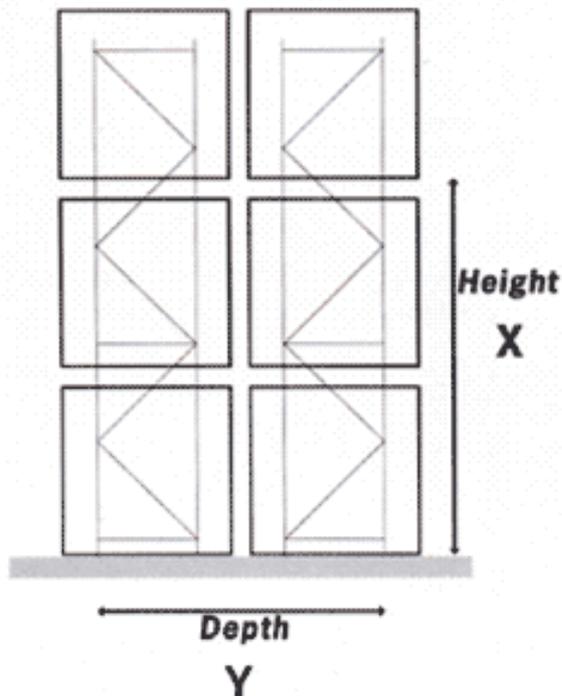


Fig. 3 Height to Depth Ratio

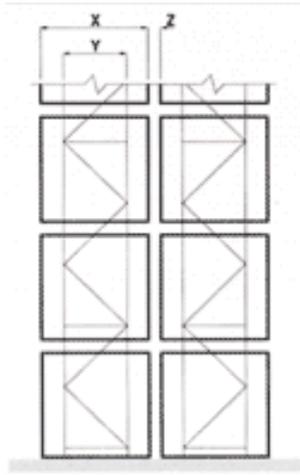
Which Pallet, Which Rack?

Width of frames, clearance between back to back loads, pallet overhang and height 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 the 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.

Fig. 4 Pallet Locations - End Elevation.



X = Overall depth of pallet.

Y = Dimension over outside of beams.

Z = Clearance between back to back pallets or loads.

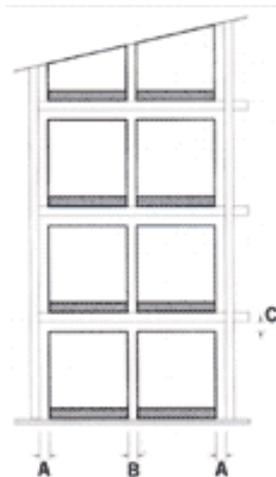
2 way entry

X	Y	Z
750	600	100
900	700	100
1000	750	750
1200	900	150

4 way entry

X	Y	Z
750	700	75
900	800	75
1000	900	100
1200	1100	100

Fig. 5 Pallet Locations - Front Elevation



Beam Height is the dimension from floor to top of beam.

A = clearance between pallet or load and upright.

B = clearance between adjacent pallets or loads.

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

BEAM HEIGHT	A	B	C
3,000	75	75	75
6,000	75	75	100
9,000	75*	75*	125*
12,000	75*	75*	150*

* These dimensions may be reduced in certain circumstances, for example for trucks with an elevatable operating position.

Rack Protection

Racking is manufactured from tough, but light, gauge sections and cannot withstand much abuse. For example, being hit by lift-trucks and other handling equipment.

The best protection is the proper training of drivers to minimise such damage. As a backup, rack protectors should be fitted so that they, rather than the structural components of the racking, can take the initial force of any impact. In fact under Health & safety in Retail and Wholesale Warehouses guidelines it is now 'best practice' to fit rack protectors, or crash barriers as they are sometimes called, to the end of all racks that could be struck. These should provide conspicuous visual guidance for drivers as well as offering mechanical protection.

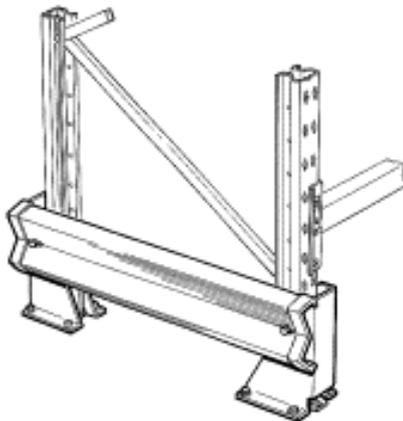


Fig. 6 Rack End Protector

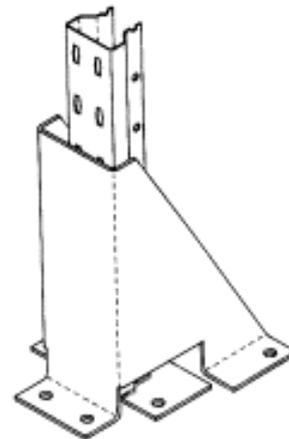


Fig. 7 Column Guard

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2. 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

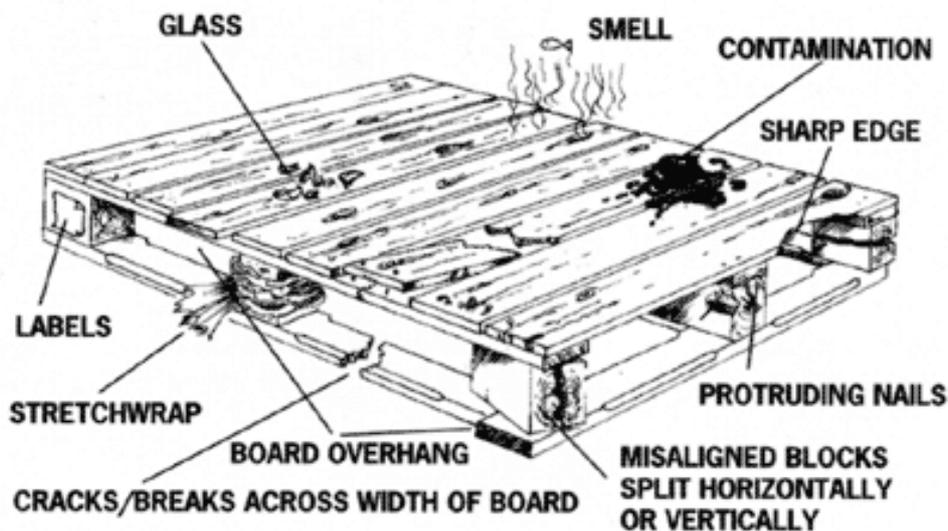
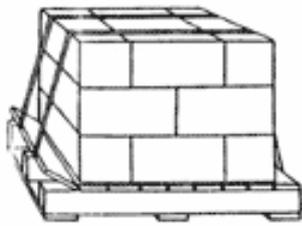


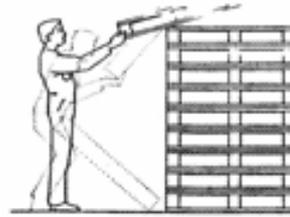
Fig. 8 Information supplied courtesy of GKN Chep Ltd.

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.
- Expendable pallets i.e. pallets designed for one delivery only, should not be re-used.
- Care should be taken when using strapping.
- The correct type of pallet for the 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.



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.

Fig. 9 Common Pallet Handling Faults.

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 lift 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 programmes in operation?

The following publications should be consulted for specific details regarding pallets and mechanical handling equipment: -

- Health & Safety in Retail & Wholesale Warehouses.
- Safety In Working With Lift-Trucks
- Safety In The Use Of Timber Pallets

(see [further information](#) for details)

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1. What Are The Key Safety Elements Associated With Shelving?

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

- Is the shelving erected on sound, level floors?
- Is it installed in accordance with the manufacturer's instructions?
- If likely to be hit by a mechanical order picker is the shelving adequately protected and properly fixed down?
- Do goods overhang shelves?
- Is all shelving fixed when being used with a ladder?
- Are all baseplates, if fitted, in such a position that they can not be dislodged?
- Do all shelves have adequate bracing and/ or cladding for stability?
- Are all clips and bolts securely fixed at both ends of the shelf?
- Are all shelves, beams and uprights in alignment?
- Is there any obvious physical damage?
- Do you allow people to climb on shelving?

If in doubt about any of these points consult the manufacturer of the equipment or one of their authorised distributors.

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2. What Are The Major Elements Of The Manual Handling Regulations?

(Ref.: Manual Handling Operations Regulations 1992)

In almost all storage requirements, manual handling will take place and this has been the subject of the Manual Handling Operations Regulations implemented on 1st January 1993.

Over a third of all reported accidents in warehouses are related to manual handling.

The Manual Handling Regulations apply to all lifting, pulling, pushing and carrying and includes any handling where the effort is made indirectly i.e. hauling on a rope or pulling on a lever. Team handling in addition to individual handling is included.

Risk assessments should be carried out on all manual-handling operations within your department. The following checklist may assist you:

<i>The Tasks</i>	Yes	No
Do they involve holding loads at a distance from the body?		
Are unsatisfactory body movements required i.e. stooping, twisting?		
Do they involve excessive pushing or pulling?		
Do they involve frequent or prolonged physical effort?		
Are there sufficient rest periods?		
<i>The Loads</i>		
Are they heavy, bulky, difficult to grasp, unstable, sharp or hot?		
<i>The Working Environment</i>		
Are there space constraints preventing good posture?		
Are there uneven, slippery or unstable floors?		
Are there variations in floor levels?		
Are there poor lighting conditions?		
Are temperature levels satisfactory?		
<i>Individual Capability</i>		
Does the job require unusual strength?		
Could the job be a hazard to pregnant workers or those with health problems?		
Does the job require special training or information?		

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3. What Are The Guidelines On Lifting And Lowering?

(Ref.: Manual Handling Operations Regulations 1992)

Due to the different capabilities of individuals, no specific interpretation can be made. However, a basic guideline is set out below:

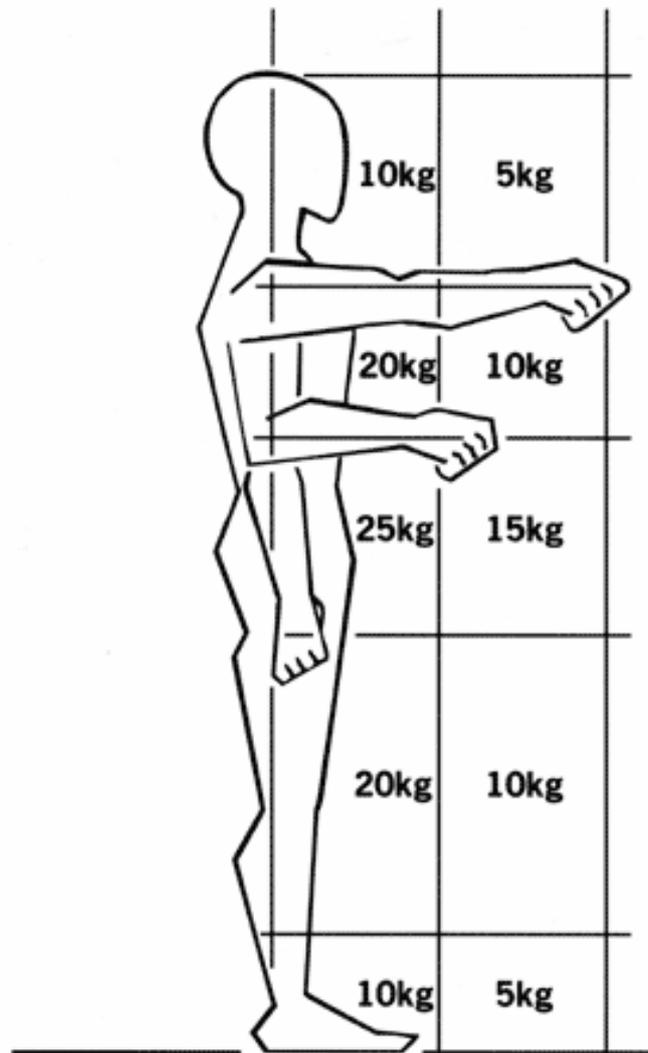


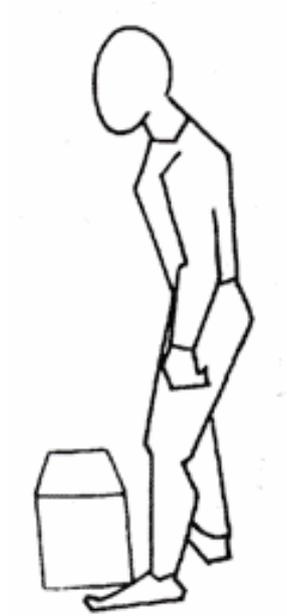
Fig 10. Lifting & Lowering

The guidelines assume that the load is readily grasped with both hands and that the operation is taking place in reasonable working conditions. It is apparent from the diagram that the capability to lift or lower reduces significantly the higher the arms are raised.

Safe Lifting

Follow these safe-lifting principles:

- Stop and think
- Plan the lift and route. Use handling aids if possible. Remove obstructions.



- Place the feet apart giving a balanced and stable base for lifting.



- Adopt a good posture. Bend the knees keeping the back straight.



- Get a firm grip. Keep arms and elbows tucked in.



- Don't jerk and let your legs do the work.
- Keep close to the load and take small steps. Do not twist your body.



- Put down, then adjust.

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1. Can I Move Or Adjust Storage Systems Once In Place?

(Ref.: Health & Safety in Retail and Wholesale Warehouses 1992)

Storage systems should never be dismantled and reassembled, either partially or fully, without first unloading and consulting the manufacturer or an authorised distributor.

Unless specifically designed to be adjusted, racking and shelving should never be tampered with. Adjustment or removal of beams or bracing adversely affects the strength, load-carrying capacity and stability of the system and **should not be done** without referring to the manufacturer.

There is now a legal requirement to assess risks and failure to comply is risking the safety of your staff and yourself.

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2. What Inspection And Maintenance Should Be Undertaken?

SEMA, the Storage Equipment Manufacturers Association, outline the following maintenance guidelines:

- Always refer to supplier's drawings and/or technical data for maximum safe load.
- DO NOT alter the structure without either:
 - checking effects against manufacturer's technical data.
 - obtaining necessary approval from the manufacturer.
- Instruct operators in correct use of equipment.
- Conduct regular inspections to check for:
 - correct application and use.
 - loads within allowable safe limits.
 - accidental damaged to or dislodgement of structure components and protective equipment.
- If in doubt ALWAYS contact the manufacturer or an authorised distributor.

Planned inspection, maintenance and record keeping are now recommended with frequency related to usage. If unsure how often you should be conducting inspections consult the equipment manufacturer or an authorised distributor. Inspection and maintenance programmes are available from reputable manufacturers and specialist companies.

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3. When Should I Replace Damaged Racking And Shelving?

(Ref.: Recommended Practice for the Use of Static Racking 1989)

The manufacturer should be called in immediately if any damage occurs which affects:

- The cross-sectional profile of a main-load beam;
- The straightness of beams, frames, bracing or shelves;
- The welds and joints; or
- The bolts and clips.

Damage to uprights will reduce the system's load-carrying capacity whilst damage to bracing sections will reduce the system's capacity to withstand impact.

It does not require significant damage to shelving and racking to reduce its strength. A 3mm deformation is enough to require replacement.

To measure the deformation, take a straight edge, ideally 1m long, and place along the racking or shelving. Measure the distance between the straight edge and the damaged section. If bent in the plane of the frame (i.e. across the frame), the gap should not exceed 3mm. If bent downwards, the gap should not exceed 5mm.

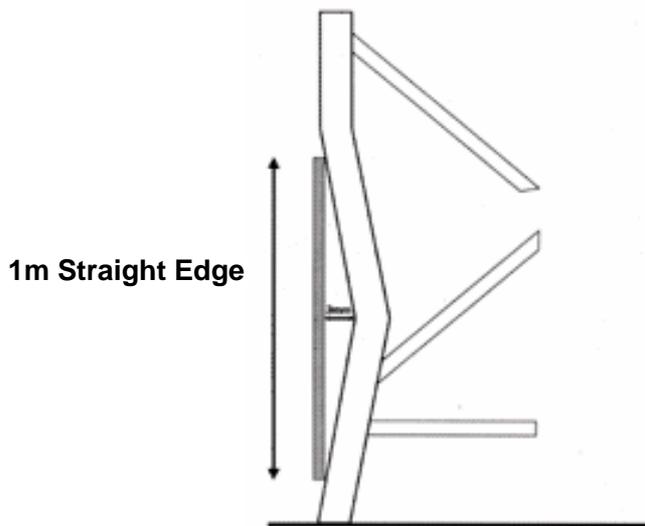


Fig. 12. Measuring Indentation

- **When did you last inspect your racking and shelving systems?**
- **Are you carrying out inspections frequently enough?**
- **Do certain sections need to be replaced?**

(Note: Where damage has been caused that could affect the safety levels, the racking or shelving should be off-loaded, aisles closed off and taken out of use until remedial or corrective action has been carried out).

This leaflet is not an authoritative interpretation of the law or a risk assessment document. It is intended to help employers and employees understand their responsibilities under the various Acts relating to the storage & retrieval of goods.

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What Further Information is Available?

The following reference sources are widely available:

Essentials of Health and Safety at Work.

ISBN 07176 0716 X

Lighting at Work.

S HS(G)38

Management of Health and Safety at Work.

HSE 1992 (1998 ISBN 07176 24153 2nd edition)

Manual Handling Operation Regulations

HSE 1992 (second edition 1998 ISBN 07176 24153)

Safety in Working with Lift Trucks.

S HS(G)6

Recommended Practice for the Use of Static Racking.

SEMA 1989

Floor Loading Warehouses.

Building Research and information association

Health and Safety in Retail and Wholesale Warehouses.

S HS(G)76

The Guide to Safety in the Use of Pallets, Pallet Converters, Palletainers and Racking.

The Cold Storage & Distribution Federation 1993

First Aid at Work

HMSO 1997 isbn 07176 10500

Approved Codes Of Practice: Control Of Substances Hazardous to Health

HMSO 1999 ISBN 07176 16703

Noise At Work. The Noise At Work Regulations

HMSO 1989 ISBN 07176 15111

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For an in-depth evaluation of your storage requirements or for details of inspection and maintenance programmes plus rack safety surveys, please call on **01908 270011**

