

Safety in the storage and handling of steel and other metal stock



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Many accidents, some resulting in death and serious injury, continue to occur during the storage and handling of steel and other metal stock. They cause enormous social and economic cost over and above the human tragedy involved. It is in everyone's interest that they are reduced. Accident investigations often show that these injuries could have been avoided.

This revised guidance is aimed at directors, owners, managers and supervisors and pays particular attention to the most common hazards, including (un)loading of delivery vehicles, storage systems, workplace transport, mechanical lifting and injuries from sharp edges.

New sections compare the use of single- versus double-hoist cranes and give additional information on the safe use of pendant and remote controllers, suitable lifting accessories, working at height and providing better access arrangements with stock products. There are now specific requirements which effectively prohibit the stacking of 'U' frame racking and 'barring-off'.

This revised guidance was produced in consultation with the National Association of Steel Services Centres (also known as NASS) and the City of Wolverhampton Council working as partners with HSE in the Steel Stockholders Lead Authority Partnership (SSLAP).

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This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

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Introduction

What is the purpose of this guidance?

1 Many accidents, some resulting in death and serious injury, continue to occur during the storage and handling of steel and other metal stock. They cause enormous social and economic cost over and above the human tragedy involved. It is in everyone's interest that they are reduced. Accident investigations often show that these injuries could have been avoided.

2 This guidance is issued by the Health and Safety Executive (HSE) and outlines the health and safety standards that need to be met in order for such accidents to be prevented. The most successful metal stockholders are well managed and already implement this good practice and consequently have excellent safety records. Applying the guidance to your work will help you manage the risks better and create a safer working environment for everyone. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

3 To avoid any possible confusion, the use of the words 'must' and 'should' have specific meanings. 'Must' is used where there is an explicit legal requirement to take certain action, for example all major injuries must be reported to the enforcing authority as this is required by a specific regulation. 'Should' is used to indicate what to do to comply with the law, although you are free to take other action, if that would also result in compliance. Generally, this is the action already being taken by the industry to ensure compliance with health and safety law. Where it is stated within the text "It is recommended that etc...", this recognises the industry's 'best practice' which goes above what is considered to be compliance with the law.

4 This publication provides practical guidance to help you:

- identify the main health and safety hazards and properly assess the risks;
- identify the likely causes of accidents and ill-health;
- appreciate the basic principles of good health and safety management;
- recognise the most common stock storage systems and handling methods as well as the advantages and disadvantages of each type;
- understand how to make sure that delivery and loading/unloading of stock is carried out safely;
- meet the requirements for provision of information, instruction, training and supervision to your employees;
- meet your obligations in health and safety law.

5 Illustrations of safe and unsafe practice will help you understand good risk management more clearly while photographs will help identify equipment and storage systems. There is a glossary of some of the terms used and references throughout will help you find additional useful information.

Who should read it?

6 This guidance is important for employers, directors, managers, supervisors, safety representatives, trainers, safety advisers and self-employed people in organisations such as:

- stock producers;
- stockholders, metal processors and service centres;
- stock hauliers;
- stock users, eg manufacturers and fabricators;
- racking and handling equipment manufacturers and suppliers.

What doesn't it cover?

7 This guidance is not intended to cover all risks that might exist at all metal stockholders. Examples of activities/topics it does **not** cover include:

- Noise and vibration issues
- Exposure to hazardous substances
- Electrical safety issues
- Workplace welfare
- Metal processing activities and machinery
- Handling of wire products and other specialised stock products

8 For information about general health and safety risks, you should visit the Health and Safety Toolbox ¹ or use the HSE website search facility for specific topics.

Causes of accidents in stock handling

9 The most serious and sometimes **fatal** incidents usually involve:

- falling stock or during lifting activities;
- moving vehicles;
- falls from height.

10 Other common causes of serious injury and ill health include:

- musculoskeletal issues;
- slips and trips;
- sharp edges;
- finger traps and pinches.

Case study 1

Bundles of rolled bar and section were stacked (free standing) on the floor within a warehouse, separated by wooden bearers. Two employees were walking down an aisle nearby when the steel banding to one of the bundles at the bottom of the stack failed. The bundle separated causing the entire stack to collapse onto the two men who were both seriously injured.

Root causes

- Failure of the steel banding, possibly caused by an unsafe lifting operation using the banding itself
- Unsuitable storage of mixed steel stock bundles
- Poor separation and containment of stock from pedestrian aisle
- Poor overall design and management of storage and storage systems

Case study 2

Following delivery, an employee was loading 8 ft long steel bars into an 'A' frame vertical storage rack. The restraining chains for holding the stock in place were removed to allow loading. However, there was insufficient room in the rack and the last few bars were stored in an almost vertical position. As the employee turned to pick up another bar, several bars fell out of the rack and onto him causing serious injury.



Root causes

- Poor stock control and purchasing arrangements
- Poor management and supervision of the delivery operation to identify how to prevent potential risks
- Insufficient storage facility/capacity to accommodate the delivery
- Inadequate instruction to staff on how to load new stock safely

What are the legal duties?

11 The main law governing health and safety at work in the United Kingdom is the *Health and Safety at Work etc Act 1974* (HSW Act). This places general duties on you to do what is *reasonably practicable*. This means balancing the level of risk against the measures needed to control the risk in terms of money, time or trouble. You do not need to take action if it would be grossly disproportionate to the level of risk. Other regulations supporting the HSW Act set out more detailed legal duties for specific activities or industries.

12 If you are responsible for the running of a metal stock operation, either as an employer or as a self-employed person, you must ensure, so far as is reasonably practicable, the health and safety of yourself, your employees and others who may be affected by what you do and what you fail to do. The main requirements for employers are outlined in this publication.

13 Employees who work for you also have a duty to take care of their own and other people's health and safety and to follow health and safety procedures at work.

14 Suppliers, manufacturers, designers and installers etc also have legal duties. They should make sure that any articles and substances supplied for use at work are safe and provide adequate information to enable you to use them safely.

The basics – what you need to do

Assessing and controlling the risks

15 As part of managing the health and safety of your business, you must control the risks in your workplace. To do this you need to think about what might cause harm to people and decide whether you are taking reasonable steps to prevent that harm. This is known as risk assessment and it is something you are required by law to carry out. If you have fewer than five employees you don't have to write anything down.

16 Risk assessment is about identifying and taking sensible and proportionate measures to control the risks in your workplace, not about creating huge amounts of paperwork. You are probably already taking steps to protect your employees, but your risk assessment will help you decide whether you should be doing more.

17 Think about your workplace activities and about how accidents and ill health could happen. Concentrate on real risks – those that are most likely to occur and which will cause the most harm. Those evaluating risk should be competent to do so. This includes having a comprehensive knowledge of the workplace activities, the hazards involved and the ways in which they can harm people as well as the probability of the hazard occurring. They should also know the minimum standards of risk control set by the law and how they are to be achieved.

18 You can often find additional information in the following ways:

- Ask your employees what they think the hazards are. They may notice things that are not obvious to you and they may have some good ideas on how to control the risks.
- Check manufacturers' instructions or data sheets for chemicals and equipment. They can be very helpful in spelling out the hazards and how this might affect your workplace.

19 Some examples of common hazards in metal stockholding include:

- being struck or crushed by moving stock, eg when it falls from a vehicle during unloading, when it moves/falls during lifting/handling operations or when storage and containment systems fail;
- being struck or crushed by heavy lifting attachments that unexpectedly topple over;
- being struck by moving vehicles, eg during reversing operations in delivery areas or by fork lift trucks (FLTs) in storage/processing areas;
- falls from height, eg from vehicles and when accessing stock and storage systems;
- back injuries and other musculoskeletal disorders from manually moving stock from vehicles/storage systems or from moving heavy lifting accessories;
- slips and trips, eg on poorly maintained floors, untidy work areas or from oil/water spillages;
- cuts from sharp edges, eg from banding or sheet stock.

20 It is important to recognise all people who may be at risk of injury or ill health. This can include operatives, FLT drivers, delivery drivers, maintenance staff, cleaners, contractors, visitors, stock takers, young workers/trainees, shift workers, agency staff and even members of the public.

21 Some workers may have particular requirements, for example new and young workers, migrant workers, new or expectant mothers, people with disabilities, temporary workers, contractors and lone workers.

22 Having identified the hazards, you then have to decide how likely it is that harm will occur. Risk is a part of everyday life and you are not expected to eliminate all risks. What you must do is make sure you know about the main risks and the things you need to do to manage them responsibly. Generally, you need to do everything reasonably practicable to protect people from harm.

23 If the risk is judged to be unacceptably high, the employer needs to consider and identify what more needs to be done to reduce the risk to an acceptable level. This guidance should help you find a solution although there may be other ways of reducing risk not covered by this guidance.

24 Make a record of your significant findings: the hazards, how people might be harmed by them and what you have in place to control the risks. Any record produced should be simple and focused on controls. If you have fewer than five employees you do not have to write anything down. But it is useful to do this so you can review it at a later date, for example if something changes. If you have five or more employees, you are required by law to write it down.

25 Few workplaces stay the same, so it makes sense to review what you are doing on an ongoing basis. Work equipment and methods of working should be checked early on in their use, and then periodically, to make sure that they are safe and to verify that the information, instruction, training and supervision provided for staff is adequate and effective. They should also be reviewed if there is a significant change in the work activity.

26 More guidance on risk assessment can be found on the HSE website.²

Consulting your employees

27 Workplaces where employees are involved in taking decisions about health and safety are safer and healthier. Collaboration with your employees helps you to manage health and safety in a practical way by:

- helping you spot workplace risks;
- making sure health and safety controls are practical;
- increasing the level of commitment to working in a safe and healthy way.

28 You must consult all your employees, in good time, on health and safety matters. In workplaces where a trade union is recognised, this will be through trade union health and safety representatives. In non-unionised workplaces, you can consult either directly or through other elected representatives.

29 Consultation involves employers not only giving information to employees but also listening to them and taking account of what they say before making health and safety decisions. Issues you should consult employees on include:

- risks arising from their work;
- proposals to manage and/or control the risks;
- the best ways of providing information and training.

30 For further information on your legal duties see the HSE leaflet INDG232³ and for general information on consulting with your employees see HSE's worker involvement website.⁴

Providing information, instruction and training

31 Everyone who works for you needs to know how to work safely and without risks to health. You must provide clear instructions, information and adequate training for your employees on:

- the risks they may face;
- measures in place to control the risks;
- how to follow any emergency procedures.

32 It is particularly important to consider the training needs and supervision of:

- new recruits and trainees;
- young people and those with disabilities who are particularly vulnerable to accidents;
- people changing jobs, or taking on new responsibilities;
- temporary staff;
- health and safety representatives, who have particular laws relating to them.

33 Do not let unauthorised, unqualified or untrained people use machinery. Some workers (eg new starters, young people or those with disabilities) may be particularly at risk and need additional instruction, training or supervision. Never assume an employee can use work equipment safely, especially if they have just started work, even if they have used similar equipment elsewhere.

34 Make sure employees have the knowledge they need to use (and maintain) equipment safely:

- Give them the information they need (eg manufacturer's instructions, operating manuals etc) and check they understand them.
- Instruct them on safe systems of work and what they are expected to do.
- Training will often be necessary, particularly if control of the risk depends on how an employee uses the work equipment.
- An inexperienced employee may need instruction on how to use hand tools safely.

35 Training may be needed for existing staff as well as inexperienced staff or new starters, particularly if they have to use powered machinery. The greater the danger, the better the training needs to be. For some high-risk work such as driving fork-lift trucks and operating a crane, training is usually carried out by specialist instructors. Actual workplace familiarisation with this equipment is also important, so make sure that the operator receives training in their own workplace using their own equipment. Receiving training should only be considered as one aspect of becoming competent as new skills and knowledge need to be applied in practice.

36 Remember, younger people can be quite skilful when moving and handling powered equipment, but they may lack experience and judgement and require additional supervision. The level of supervision needed will depend on how mature they are and whether they can work safely without putting themselves or others at risk.

37 Overseas and migrant workers are commonly found in the steel industry including foreign delivery drivers who attend unfamiliar sites. For migrant workers you should focus on four main areas to make sure they are protected:

- **Competence:** Before they start work, check that they have the occupational qualifications or skills needed for the job.

- **Training:** They may be completely unfamiliar with workplace risks – make sure induction training is clear and simple.
- **Communication:** They may have problems communicating in English – make sure you communicate clearly and effectively. Make sure workers understand what is required of them and know how to raise concerns if they are unsure.
- **Attitude to health and safety:** Make sure they understand the importance of health and safety in your workplace, and how it's managed. Use effective supervision to identify and address any weaknesses in understanding instruction and training.

38 For more specific advice see INDG345⁵ and INDG229.⁶ For more HSE guidance on managing the health and safety of migrant workers, see HSE's web pages on migrant workers.⁷

Your workplace

39 You must provide a safe and healthy environment for all your employees and consider their welfare needs. You must consider things such as:

- suitable lighting, including emergency lighting;
- sufficient workspace and a suitable workstation design;
- maintaining a comfortable temperature and effective ventilation;
- toilets and washing facilities;
- drinking water and facilities to eat meals;
- the safe movement of people and vehicles;
- suitable maintenance and cleaning measures;
- the needs of people with disabilities;
- facilities for changing and storing clothing (where this is needed).

40 For additional guidance on working temperatures and relevant ill health issues, see HSE leaflet INDG449⁸ and the HSE web pages on temperature.⁹

41 For work outdoors you should consider things such as the weather, including sun exposure, temperature (both hot and cold) and providing readily accessible toilets and washing facilities where possible.

42 Of particular importance in stockholders are gangways and aisles which should:

- be separated from storage areas, wherever possible, by means of suitable physical barriers;
- be clearly defined using suitable floor markings to indicate gangways/aisles, work areas, storage areas etc. See Photograph 1;
- provide separate routes for vehicles and pedestrians where possible, with clearly marked and designated pedestrian crossing zones. See Photograph 2.

43 You should maintain good visibility to allow people to work safely. It is important that:

- overhead travelling-crane operators can see the load and any obstructions or people working along the route;
- drivers of vehicles can see pedestrians;
- the height of stored stock is limited to allow good visibility, eg limit the height of stored stock close to a gangway opening directly on to a vehicle route to allow drivers to see pedestrians;



Photograph 1 Storage of narrow coils in standing coil rack. Good stock containment with safe access for slingers and a protected/clearly defined pedestrian route



Photograph 2 Good layout of rack storage with clearly defined pedestrian routes and separation from fork-lift trucks

- all work areas are adequately lit and the use of other aids to improve visibility are considered, eg parabolic mirrors, high-visibility clothing;
- vehicles have good driver visibility (with or without the load). It may be necessary to improve vision on some existing vehicles, eg by fitting extra mirrors or CCTV reversing aids (see Workplace transport).

Machinery, plant and equipment

44 Have adequate maintenance arrangements in place to make sure machinery remains safe and consider how your workers use the equipment. Equipment and machinery can cause injuries by people being struck, crushed, scalded, or by suffering an electric shock.

45 Before you start using any machine, you need to think about the risks and their control. Check all safeguards are fitted and that new machines are CE marked.

46 Before maintenance starts, make sure equipment is made safe and prevent access to dangerous parts. Isolate the equipment's power supply, any uninsulated electrical supply nearby and any pressurised fluids. Make sure others are aware that maintenance is being carried out and take effective steps to prevent machinery being restarted accidentally, eg by locking off. Immobilisation may also be required where there is stored energy in a system, eg in compressed air systems.

47 Do not let unauthorised, unqualified or untrained people use machinery. Never allow people under the minimum school leaving age (currently 16 years old) to operate or help at machines. Some workers, eg new starters, young people (16-18 year olds) or those with disabilities, may be particularly at risk and need additional instruction, training or supervision. See Paragraphs 31–38 for guidance on information, instruction and training.

48 HSE's Work equipment and machinery web pages have more information.¹⁰

Personal protective equipment (PPE)

49 Employers have basic duties for the provision and use of PPE at work – but remember PPE should only be used as a last resort, ie when all other reasonably practicable ways to eliminate or reduce risks have been taken and yet there is still some residual risk.

50 PPE will protect the user against the specific health or safety risks identified during their work. You should consider the need for items such as head protection,

gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. Also consider clothing that protects the wearer against temperature extremes and the weather.

51 When selecting PPE, make sure it is CE marked and it suits the user in terms of size, fit etc. If more than one item of PPE is being worn at the same time, make sure they can be used together, eg wearing safety glasses may disturb the seal of ear muffs around the ear thereby negating their noise protection. Make sure that users of PPE are instructed and trained on its use and it is maintained, stored and cleaned appropriately and available at all times.

52 Table 1 lists some suitable PPE for typical hazards in the industry.

Table 1 Some typical hazards and associated PPE in metal stock storage and handling environments

Hazard	Suitable PPE
stock movement and falling items	<ul style="list-style-type: none"> ● steel toe-cap footwear ● suitable head protection
heat, cold, bad weather	<ul style="list-style-type: none"> ● overalls ● warm or waterproof clothing
moving vehicles, including fork-lift trucks and cranes	<ul style="list-style-type: none"> ● high-visibility jackets/tabards
slips	<ul style="list-style-type: none"> ● safety footwear with slip resistant soles
sharp edges	<ul style="list-style-type: none"> ● gloves ● gauntlets ● forearm protection ● aprons ● hand pads ● thumb guards ● gaiters ● leggings ● head protection ● face visors
noise	<ul style="list-style-type: none"> ● hearing protection

Working at height

53 Working at height remains one of the biggest causes of work-related deaths and major injuries. Make sure that all work at height is properly planned, supervised and carried out by competent people. This includes using the right type of access equipment for the job, particularly for maintenance work, eg on overhead cranes.

54 The following hierarchy of control measures should be followed systematically:

- Avoid work at height where you can.
- Use equipment to prevent falls where work at height cannot be avoided.
- Use equipment to minimise the distance and consequences of a fall where the risk cannot be eliminated.

55 If work at height cannot be avoided, collective control measures should always take priority over personal control measures. Collective measures (eg scaffolds, nets, soft landing systems) protect everyone who is at risk rather than offering protection to one individual (eg a harness).

56 Only use ladders for work at height where a risk assessment has shown that using equipment offering a higher level of fall protection is not justified because of the low risk and short duration of the task. Ladders should only be used in situations where they can be used safely, for example where the ladder will be level and stable and can be secured in some way.

57 Key points to consider are:

- Do as much work as possible from ground/floor level.
- Equipment should be stable and strong enough for the job.
- Don't overload or overreach when using ladders.
- Take precautions when working on or near fragile surfaces (eg plastic or corrugated roof sheets).
- Make sure workers can get safely to and from where they work at height.
- Think about emergency evacuation and rescue procedures.
- Provide protection from falling objects.
- Make sure equipment is maintained and inspected regularly.

58 For stockholders, the primary issue is workers climbing up and over metal stock, particularly for attaching lifting equipment and when working on/from vehicles. See Handling (from paragraph 106 onwards). Find out more on working at height on HSE's Work at height web pages,¹¹ and more specific industry guidance about the use of fall arrest systems in metal stockholding in *Use of fall arrest systems in steel stockholders*.¹²

Slips and trips

59 Slips and trips are the most common cause of injury at work. Most slips occur when floors become wet or contaminated and many trips are due to poor housekeeping. Slips and trips on delivery vehicles are a particular issue in this industry. The floor surface design and material is of great importance in reducing the risk along with preventing access up onto elevated areas which may be contaminated by bad weather.

60 To prevent slips and trips:

- Stop floors getting wet or contaminated in the first place.
- Have procedures in place for routine and responsive cleaning.
- Clean spillages up quickly.
- Stop anyone walking on floors until they are dry and use the right cleaning methods and products.
- Look out for, and address, trip hazards (eg uneven floors, trailing cables).
- Encourage good housekeeping by your workers.
- Wear suitable footwear.

61 Good housekeeping is important to reduce the risk of slips and trips. In stockholders you should pay particular attention to the following:

- Keep designated work areas and walkways free from tripping hazards, eg poorly stored materials or equipment, empty pallets, waste and loose banding and packaging materials.

- Keep floor and road surfaces level and properly maintained, eg free of potholes, protruding objects, and inadequately covered drains/manholes.
- Keep floors free of leakages and spillages.
- Keep roadways and loading/unloading areas free from ice and snow in winter.

62 More information can be found on HSE's Slips and trips web pages.¹³

Storage and storage systems

Which storage systems are best suited to different types of stock?

63 Deciding on storage systems that are suitable and fit for purpose is important in controlling health and safety risks to staff. Stock should always be stored and stacked so that it is not likely to fall, move or cause injury. In general you should limit the height of stored stock and minimise stock movements as far as possible. Stored stock can either be:

- contained in a storage system, ie restrained or supported by racks or other permanent or semi-permanent storage equipment (including frames or stillages); or
- free-standing, ie stored on the ground without any fixed supports or racks.

64 In most circumstances some form of storage system will be required, but certain types of stock, such as bore-vertical coils and long, broad stock, may also be suited to being stored free-standing. Stock is also more likely to be free standing in temporary storage areas, eg in loading areas before being loaded onto vehicles or after unloading but before they are relocated into permanent storage. Splitting racks could also be considered to be temporary storage. The same risk assessment requirements and control measure standards apply to temporary storage areas as to permanent storage. Temporary storage may even require additional measures (eg additional strapping between broad coils) to ensure its stability and safety.

65 There are automated storage and handling systems for metal stockholding within Europe but these are not typically used in the UK. For general information on these systems within warehousing see HSG76.¹⁴

66 All racking/storage systems (including temporary storage) should be designed to be fit for purpose. They should accommodate the intended product dimensions and safely support the maximum anticipated loading. They should be installed by competent people and used in accordance within their design capabilities. In addition, you should obtain key information about the requirements for safe use of all storage equipment, including:

- suppliers' information on the requirements for safe installation, operation and maintenance of the equipment, including safe loading capacities and distribution of the loads across the racking;
- results of structural surveys carried out in advance of equipment installation, particularly where racking is required to be fixed to a wall and/or floor;
- in-house inspection reports to review causes of damage/misuse of present systems and remedial action.

67 The choice of storage system will depend on a number of general factors, including:

- location of storage;
- available space and access requirements;
- floor type;
- type and stability of stock;
- handling system to be used;
- anticipated stock quantities;
- frequency of movements;
- picking requirements of the user.

68 You also need to consider the significant risks in operating such storage systems as already covered in Paragraph 19.

69 Tables 2–4 detail what to consider when choosing a storage system or combination of storage systems which best fits your business needs and offers an appropriate level of safety.

Table 2 Environment, structure, plant and equipment

Environmental conditions	<ul style="list-style-type: none"> ● Consider the location and the space available. ● Products stored in the open can be affected by high winds, rain or ice.
Housekeeping issues	<ul style="list-style-type: none"> ● Make suitable arrangements for preventing slips and trips in and around stock and storage systems.
Design and fixing	<ul style="list-style-type: none"> ● Where the design of the racking requires it to be secured to the building, only use building parts which have been proved by structural calculations. ● The design of the racking must be compatible with the building/structure layout.
Guarding	<ul style="list-style-type: none"> ● Make suitable provision to protect the racking from impact damage (eg the fitting of suitable column guards may help to protect uprights from impact damage from moving trucks).
Floor/ground condition.	<ul style="list-style-type: none"> ● Uneven, inclined or wet/muddy ground can affect stock stability. ● What access is needed for safe handling (eg rough terrain FLT)?
Floor capacity	<ul style="list-style-type: none"> ● Do not exceed permissible loadings of internal floors (including any point loading issues at each base plate for racking systems). ● Load capacity of external surfaces may be affected by sewers, culverts, loose ground etc.
Collision with pedestrians	<ul style="list-style-type: none"> ● The main dangers are from passing FLTs, overhead travelling cranes or heavy goods vehicles.
Handling and visibility	<ul style="list-style-type: none"> ● Provide adequate lighting. ● Do staff need PPE, including high-visibility clothing? ● Is visibility of product and storage areas for operators of cranes and other handling equipment (eg FLTs) adequate? ● Are there blind spots? Can you fit aids for reversing (eg CCTV)? ● Make sure crane operators can clearly see the load and any obstructions or people that may be affected by the lift.
Vibration	<ul style="list-style-type: none"> ● Traffic and movement of other large masses, eg large presses or cranes can cause vibration and affect product stability.
Access	<ul style="list-style-type: none"> ● Have safe means of access for all foreseeable access requirements to make sure falls from height are prevented (eg the attachment of lifting accessories while stock taking etc to avoid the need for climbing on or over stock).

Table 3 Storage systems

<p>Layout and design of storage</p>	<ul style="list-style-type: none"> ● This will include racks and shelving, bearers, chocks, and banding/strapping etc. Consider: <ul style="list-style-type: none"> ● strength of structural members and design; ● use of bearers/battens/banding, and foreseeable effects of failure on stack stability; ● stacking patterns and any likely stack failure modes. ● The storage system should fit properly with associated handling equipment, eg: <ul style="list-style-type: none"> ● aisles should be wide enough to make sure that mechanical handling equipment can be easily and safely manoeuvred without risk of damage to racking; ● overhead clearances should be sufficient to permit the safe operation of cranes and lifting equipment; ● arrangements for storage of lifting accessories (eg C hooks) should be catered for within the stock storage areas.
<p>Impact loadings</p>	<ul style="list-style-type: none"> ● Check what loads the system (including aisle barriers or end uprights) needs to be able to withstand from contact with vehicles or suspended loads, or from stock collapses etc. ● Each system should be clearly marked with a notice stating its safe working load (SWL) or rated capacity together with any necessary specified load configurations (see Figure 1). ● Storage systems should be able to contain the stock within the storage area in the event of stack collapse or failure, so that stock does not fall into walkways or work areas.
<p>Stock and related accessories. See also Table 4</p>	<ul style="list-style-type: none"> ● What are the maximum tonnages and volumes to be stored, how will they be accessed and are there any foreseeable changes in the future? ● What are the turnover rates of products? ● Consider banding (bundling) of supplied stock and typical delivery quantities. ● What are the physical characteristics of the stock (and any ancillary items) to be stored or handled, eg size, mass, shape, surface finish, centre of gravity, or stability? ● The physical characteristics of the product material and types (eg long, narrow) determine their inherent stability. If there is any doubt about a product's inherent stability, then it is most likely to require a suitable racking system. The main types of stock and options for suitable storage systems are outlined in Table 4.
<p>Operation and maintenance</p>	<ul style="list-style-type: none"> ● Develop safe systems of work for operating the storage systems. ● Make arrangements for the maintenance and inspection of all storage systems (including during stock take). See Appendix 1 for an example of a record for inspection of racking systems. ● Include a criteria for replacement of damaged parts of racking.

70 Racking systems are normally designed to be used with a limited range of product type. All these factors should be considered as part of the risk assessment in deciding which storage system is fit for purpose and what control measures are required to implement and maintain these systems. Detailed descriptions of common storage systems are shown in tables 5–16.

Table 4 Suitability of storage systems

Stock Type	Description	Key Characteristics	Storage Options
Long, Narrow	<p>Tube, bar, angles, hollow section etc. Material in this category includes smaller section beams and columns</p> <p>No standard definition exists, but as a general guide (subject to local risk assessment), material where the maximum web or flange dimension is < 350mm should typically be considered as Narrow</p>	<p>Prone to toppling or easily knocked over when stacked.</p> <p>Rerolled and other small sections may be quite flexible, so handling and storage systems need to provide adequate support.</p>	<p>Most stable when stored horizontally in storage racks:</p> <ul style="list-style-type: none"> ● Toast racking ● Cantilever racking ● Ladder racking ● Stillages ● Cradles ● 'A' frames (usually used for light and high value stock) ● Single level 'U' frame
Long, Broad	<p>Universal beams and larger sections such as channels</p> <p>No standard definition exists, but as a general guide (subject to local risk assessment), material where the minimum web or flange dimension is > 400mm would typically be considered as Broad</p>	<p>Larger sections are less prone (though not immune) to toppling when stacked.</p>	<p>Most stable when stored within a racking system although they may be suited to free-standing storage on bearers with other additional precautions:</p> <ul style="list-style-type: none"> ● Toast Racking ● Cantilever racking ● Free Standing
Coil, Narrow	<p>No standard definition exists, but as a general guide (subject to local risk assessment), material <300mm wide or where the width to outside diameter (OD) ratio exceeds 1:4 should be considered to be Narrow coil</p>	<p>Prone to toppling and rolling when stored bore-horizontal.</p> <p>Packs of narrow coils, even when securely banded together, are still prone to toppling and should not be regarded as a single coil of the same width / OD</p>	<p>Bore-horizontal:</p> <p>Bore-horizontal narrow coil must not be stored free standing</p> <ul style="list-style-type: none"> ● Cages or cassettes ● Horizontal cantilever support ● Leaning coil rack ● Standing coil rack <p>Bore vertical (known as 'eye- to-sky'):</p> <ul style="list-style-type: none"> ● Free standing ● Box pallets

Coil, Broad	No standard definition exists, but as a general guide (subject to local risk assessment), material >300mm wide and where the width to outside diameter (OD) ratio does not exceed 1:4 may be considered to be Broad coil	<p>Prone to rolling when bore-horizontal.</p> <p>Potentially high density of storage so floor loadings and structural integrity of storage system is particularly relevant</p> <p>Parent broad coil is rarely stored bore vertical due to difficulty in handling its size and weight</p>	<p>Should be stored bore-horizontal supported in a racking system, chocked, or (very occasionally) bore-vertical</p> <ul style="list-style-type: none"> ● Coil wells (generally being phased out in the UK) ● Standing coil racks ● Cradles ● Free standing (chocked, bore-horizontal) ● Free standing bore-vertical (now unusual)
Sheet / Plate	Rectangular sheet, plate or blanks	<p>Potentially high density of storage so floor loadings and compression strength of any wooden pallets/ battens is particularly relevant.</p> <p>Generally stable but for smaller sizes stability/stack height should be considered</p>	<p>Most stable when laid flat, rather than stored vertical</p> <ul style="list-style-type: none"> ● Free standing on bearers ● Free standing palletised ● Pallet racking ● Cantilever racking ● Toast racking (if storing vertically)

Case Study 3

An employee entered a ladder rack to remove a bundle of light gauge tube, using a single hoist crane. A rack was filled with three tonnes of bundled tube. When the cross member was removed, the upright column deflected causing the remaining cross members to fall. The bundled tube and the employee fell approximately one metre through the rack. The collapsing upright caught on a neighbouring rack and partially supported the fallen bundles. The employee suffered serious injury, however, this could easily have been a fatal incident.

Root causes

- Partial collapse of ladder rack due to overloading issues
- Failure to inspect and maintain the ladder racking
- Inadequate planning of lifting, including poor access arrangements into the racking resulting in an unsafe lifting operation.
- Lifting carried out by a poorly trained and instructed employee
- Poor overall management and supervision of lifting operations

Common types of supported storage systems

71 Tables 5–16 show the common types of supported storage systems, including different designs within each system. The tables describe the nature of the design and the types of product commonly stored on them along with the advantages and disadvantages of each system and particular hazards and risks associated with their design, manufacture, installation, use and ongoing inspection/maintenance.

Table 5 Cantilever racking



- Simple construction of vertical stanchions and horizontal arms which hold the stored material.
- Racks can be single or double-sided. Smaller versions with sloping arms are known as 'Christmas tree racking'.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Safe working loads should be clearly displayed for the whole racking structure as well as individual loading limits for horizontal arms/levels. See paragraph 78. To prevent imbalance in the racking structure, instruct employees how to evenly distribute stock across all levels and arms as well as the whole racking system. ● Storage areas should have good lighting systems with low glare to enable handling equipment to be used safely and efficiently. ● Cradles can be used to store products on cantilever arms. This avoids rebanding issues or risk of loose product falling during handling. ● Versatile – can also be used for sheet product (palletised and unpalletised). ● Products on racking are easy to access and mostly handled by FLT, side loader or other specialist handling equipment. ● Potential for high storage density which is easy to manage/handle. 	<ul style="list-style-type: none"> ● Storage of excessively long and 'flexible' material can cause unsupported parts of material to sag or bow. This can result in handling issues and uneven loading across the racking structure. ● Poor handling/loading techniques can cause bending and twisting of arms. ● Risk of pedestrians (or handling equipment) striking material not fully contained in the racking. ● Risk of loose product falling when being returned to storage. Stock should be bundled or the arms should have fixed 'end stops' or slightly raked arms. ● Full bundles should be brought to ground level for picking purposes. Any 'unstable' product (ie prone to inadvertent movement), should be reband before being returned to storage. ● Provide suitable access for stocktaking to prevent climbing on the racking.

Table 6 Toast racking and splitting racks



- Simple construction of substantial vertical stanchions fixed to a horizontal frame (running at right angles) with bundles of material stacked between the stanchions.
- Suitable for long lengths of product. Similar products and lengths should be stored in the same slots.
- Splitting racks are similar to toast racking but are usually shorter.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Handling is normally by overhead crane. This should be with twin hoists as this can substantially reduce or even eliminate the need for operators to enter racks and the associated risks of falls from height and crushing between the bundles and the rack structure. ● The stanchions should restrain movement of stock and prevent it toppling into gangways and working areas. ● The height of the uprights should always be higher than the stack to retain the stock safely (ie do not stock above the top of the upright). ● It is recommended that rounded 'tips' to the uprights are provided to prevent stock being caught on the tip. ● Proprietary splitting racks should be used during 'order picking' as it may be necessary for bundles to be split into smaller quantities. The rack should be designed to contain the bundles being split and prevent people from being hit by moving stock when the banding is cut. ● Flexible – can act as temporary storage in loading or delivery areas or as overflow storage when permanent storage is full. 	<ul style="list-style-type: none"> ● Single hoist cranes should only be used where your risk assessment demonstrates that single hoist handling can be carried out safely with suitable control measures in place. The risk assessment should highlight the precautions that should be taken to enable the safe attachment of lifting accessories and safe access to the products being lifted. ● People climbing over stock risk falling and trapping/crushing from dislodged products. ● Construction needs to take into account possible shock loading and potential side loading on uprights when storing tube and pipe products. This leads to spread of uprights. A competent engineer should be consulted to verify new designs and to check current systems are fit for purpose. ● End uprights alongside a pedestrian route/gangway may need to be strengthened to contain any possible collapse of the racking system. ● Trip hazards from discarded banding or bearers should be avoided through good housekeeping. Stock which is poorly positioned or located may also present trip and other hazards. ● Stability issues can be caused by stacks made up of different profiles, mixed product dimensions, defective bearers or bearers of differing sizes. ● Storing different types of product and multiple sizes within one section is possible, but causes handling problems and is inefficient.

Table 7 A-frames



- Sometimes known as 'leaning racks'.
- An A-shaped upright frame used to store material vertically. Horizontal arms are fitted to divide stock.
- Usually used for light products due to manual handling constraints, and also very often high value products (eg stainless steel or aluminium).

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Products are stored upright between the arms, and often restrained using chains/straps. ● Chains or straps should be located at a suitable height (based on risk assessment) which is easy to access but also prevents toppling of the product. 	<ul style="list-style-type: none"> ● Lightweight construction generally gives a relatively low SWL which should not be exceeded. ● Risk of damage from FLT's/overhead cranes. ● Overstocking beyond the dividing arms is commonplace. This often causes product to be stored outside the base or moveable restraints, leading to instability of the product. ● Chains/straps are not always used even when fitted to arms. ● Limited storage capacity per location. ● Manual handling issues – particularly for very long product where access may be difficult and working space restricted.

Table 8 Ladder racks



- Similar construction to toast racks but have detachable horizontal metal members supported by vertical metal stanchions.
- Suitable for a variety of long, narrow products.
- Now rarely installed in the industry as safer and more efficient systems are available.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Handling is normally by overhead crane. This should be with twin hoists as this can substantially reduce or even eliminate the need for operators to enter racks and the associated risks of falls from height and crushing between the bundles and the rack structure. ● Creates separate sections within one location – extends numbers of products to be stored. ● Horizontal members (fixed between the vertical members) allow large densities of diverse products to be stored. Can use like pigeon hole racking if hand picking (subject to manual handling issues). ● Some companies provide an additional brace between racks to aid stability as 'best practice'. ● The provision of safe access to the products being lifted will avoid people climbing over stock and the consequent risk of falling or trapping/crushing from dislodged products. ● It is important that design specification identifies safe working loads and side loading on stanchions. 	<ul style="list-style-type: none"> ● Single hoist cranes should only be used where your risk assessment demonstrates that single hoist handling can be carried out safely with suitable control measures. The risk assessment should highlight precautions to take to enable the safe attachment of lifting accessories and safe access to products being lifted. ● Accessibility for equipment and personnel can be difficult, as products are stored in 'pockets' within the racking. ● Stability issues as heavier items are commonly stored on the top level for crane handling while associated lower levels are hand-picked. ● System is subject to lateral loadings when storage locations on either side are empty and horizontal metal members ('ladder rungs') are removed. This can damage the vertical stanchions and cause spread. ● Manual handling issues – there is a temptation for the operator to pull out product especially if the material is not bundled. A risk assessment will determine whether this activity is regarded as safe. ● Unsafe system of work when material is 'side-pulled' with overhead crane, risking rack stability and damage to the storage system components. ● A larger range of products can be stored, but may be more difficult/less efficient to handle.

Table 9 Cradles



- Suitable for long, narrow product but is also used for sheet/plate storage.
- Very rare in stockholding because of excessive time taken for handling compared with other storage systems.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Single items can be taken out of cradles from the top level, or manually handled from the end of the product depending on the product. ● Certain types of cradles can be considered to be part of the load (when always lifted with the load) and not a lifting accessory. They are therefore, not subject to LOLER, however, they still require adequate maintenance. ● Flexible – increases location numbers and allows mixed stock in one stack. ● Access with a crane or FLT/sideloader is possible dependent on dimensions of the product. ● To avoid stability issues, the heaviest stock should be located on the bottom level. ● Requires good ground conditions to ensure overall stability and equal loading across all cradles. 	<ul style="list-style-type: none"> ● Cradles can be unstable when stacked and are reliant on the interlocking of the 'feet' as well as lateral support from the system as a whole. ● Stability of stacks should be assessed by a competent person and action taken to reduce stacking heights as necessary – some larger national stockholders have determined that a stack of two high should be the maximum height. ● Side loaders can be used when cradles are set up as paired rows/stacks, but this restricts the length of product that can be lifted. ● Top cradles and stock needs to be lifted off before access to lower cradles is possible so can be inefficient. ● Manual handling issues – there is a temptation for the operator to pull out product especially if the material is not bundled. The manual handling risk assessment will determine whether this activity is regarded as safe.

Table 10 Stillages (including coil cages)



- Portable containers, designed to rigidly support stored stock within a flexible storage system.
- Also commonly used for carrying long, narrow stock with additional horizontal tie bars.
- A specialist 'coil cage' is a type of stillage which can be used for storage and/or transportation of coils. They can also be used for handling, to flip coils from vertical to horizontal.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Relatively high densities of generally lighter materials can be stored. ● Individual stillages usually easily handled by FLT. ● Can be used in conjunction with cantilever racking or even automated systems. ● The location/positioning of this system is important in matching suitable handling equipment. ● Lifting lugs are often provided in each corner to aid crane lifting (ie lifts the whole stillage) ● Stillages are portable and therefore, can be flexibly located to suit temporary and local circumstances. Proprietary stillage systems are commonly available. ● To avoid stability issues, the heaviest stock should be located on the bottom level. ● Requires good levels of inspection and maintenance to ensure structural rigidity is maintained. ● Requires sound/level ground conditions to ensure overall stability and equal loading across all stillages. 	<ul style="list-style-type: none"> ● If material from a lower tier is required, upper tiers should be lifted off first. ● There is a risk of entrapment between tiers during mechanical and manual handling. ● Using crane to 'drag out' stock from lower levels causes instability, potential collapse of racking and risk of items falling from height. Suitable instructions and supervision should prevent this activity. ● Safe locking arrangements should be built in to the design of stillages to ensure stack stability. ● Requires numerous lifting operations to access individual locations as stacks of stillages should not be handled/lifted by FLTs. ● Stillage stacks on FLTs are very unstable and have resulted in numerous incidents including fatalities. Stacks should only be handled by FLT where the risk assessment has identified this as safe. The assessment should specify a maximum number of stillages in the stack based around load capacity and also taking into account ground/floor conditions, slopes and bends on traffic routes etc.

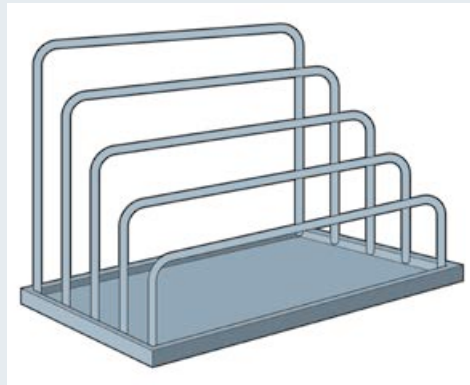
Table 11 Pallet racking



- Flexible and adjustable racking system.
- Used for the safe storage of stacked pallets of stock, usually sheet, but also suitable for narrow coil on pallets. High density storage possible with multiple locations.
- It is recommended that key components are painted in highly visible colours to aid FLT operators to locate stock, helping to reduce damage and possible incidents.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Racking should be fixed to floors and walls in order to improve stability, and to withstand any impact by FLTs/side loaders. ● Stock is easily accessible with FLTs and side loaders. ● When pallet racking is installed or modified, all beam-to-upright connections should be secured by locking pins. to prevent accidental displacement of the beam, for example by FLTs. ● Contain material within the racking system. It is critical to position pallets correctly and important to provide pallets of appropriate dimensions to match beam positions etc. ● Double sided (ie back to back) runs should be connected and spaced using suitable run spacers. ● Where single racks are installed alongside a gangway or pedestrian route, mesh type guarding should be provided at the rear to prevent products falling from height. 	<ul style="list-style-type: none"> ● Corner uprights in a run of racking are especially at risk of collision damage. Column guards should be provided to corner uprights, ideally in a conspicuous colour. ● Racking protection is recommended for other uprights; however, assess the risk of reducing clearances for FLT manoeuvring before installing protection in narrow aisles. Alternative handling equipment should also be considered. Regular racking inspection should be undertaken due to the generally lightweight construction compared to other racking systems. (See Paragraphs 72–78).

Table 12 Toast racking (sheet & plate)



- Can be used for storage of vertical sheets or plates in compartments which prevent sideways movement and allow the removal of individual sheets.
- Racking should normally be fixed to a wall or floor surface.
- You must consider safe loading, unloading and lifting accessories to be used.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Plates should be placed with their base against one upright and leaning against a second upright. All plates should lean in the same direction, be supported by at least two uprights and should not touch plates in the adjacent rack. ● Can store high volumes of product. Larger plates may require purpose built racking which includes steps and walkways to allow safe access for slingers and a safe place of work. ● Restrain sheet and plate when stored on its edge, allowing for easy access. 	<ul style="list-style-type: none"> ● Risk of failure if overloaded or subjected to shock loading. Design and construction should account for possible shock loading. ● Can be easily damaged if struck by moving plant, eg FLT's. ● Risk of cuts from sharp edges during manual handling of lighter sheet/plate. ● This racking needs regular inspection.

Table 13 Leaning coil



- A substantial support that rows of narrow coils can be leant against.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Coils are held in place by friction between the base of the coil and the floor surface, so it is important that coils are not stored on slippery or low-friction surfaces. ● Suitable side supports should be fitted to prevent coils from rolling. ● The angle of storage can be set by the design of the back rest. The back rest should be tall enough to safely support the largest diameter of coil that will be stored. ● Can be used for short term storage, eg while awaiting processing. ● Allow easy access for lifting away by crane or FLT. ● Spacer pegs are provided at the top of coils to separate bundles for handling purposes. Often, wooden battens are strapped/banded to coils as they come off slitting lines. 	<ul style="list-style-type: none"> ● Coils not stacked at the correct angle and properly separated by pegs can become unstable, slide and collapse. Larger diameter, narrow-width coils are at particular risk. ● Shrink wrapping is only designed as weather protection and should not be considered as a means of increasing the stability of a pack of narrow coil. ● The amount of coil leant against each stand/upright should be limited; overstocking can affect the lean angles of the coils leading to increased risk of slippage. ● While the use of banding can enhance stability of standing narrow coil stored on leaning coil racks, it should be stressed that the stability of these packs of coils should not be treated the same as a single coil of the same overall dimensions. Banding can move, break, or otherwise become dislodged, resulting in toppling of the whole pack/bundle.

Table 14 Standing coil racks and coil chocking systems



- Two floor-mounted, parallel, raised-base support rails with attached vertical frames. Designed to store coils vertically.
- Frames must be strong enough to retain coils within the rack and should be fitted with end posts of suitable dimensions to prevent coils falling out.
- Suitable additional coil supports/spacers, made from either wood or recycled plastic, can be used to reduce coil damage and minimise the risk of coils sliding along the rack.
- Fixed installation/storage used for a variety of narrow coil storage.
- End posts are sometimes used as a leaning rack for narrow coil.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● End stops should be designed to work with an appropriate handling system, eg an opening to allow the use of a C-hook. ● Metal frames require lining to protect the product surface and also to support the product to stop slippage, especially during handling of adjacent coils. ● You should provide safe access in the form of suitable routes and gangways so that employees do not have to enter the racks. Commonly a gangway will be provided on each side of every pair of racks. Sufficient manoeuvring space must be provided when using an FLT with a boom attachment. ● The use of banding can enhance stability. However, it should be stressed that the stability of a pack of coils should not be treated the same as a single coil of the same overall dimensions. Banding can move or break, or become dislodged resulting in toppling of the whole pack/bundle. 	<ul style="list-style-type: none"> ● Toppling and stability are real issues especially during handling activities. Risk of serious injury increases where access across racks is made necessary by unsuitable handling equipment/ attachments. ● Chains and slings should not be used because employees have to reach between the coils to attach them. ● Shrink wrapping is only designed as weather protection and should not be considered as a means of increasing the stability of a pack of narrow coil.

Table 15 Pigeon hole racking



- Pigeon holes are designed to store long, narrow products.
- Only suitable for relatively light-weight, small products which can be easily handled manually.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● Can be located in fairly dense storage areas, even among other racking types (eg under 'A' frames, see right hand photograph). ● A suitable mesh or solid panel should be fitted at the rear to prevent items from being pushed out through the back of the rack into working areas or other racks or equipment. 	<ul style="list-style-type: none"> ● Consider access requirements when working at height (eg from mobile steps or ladders) to load/unload stock. ● Manual handling of multiple items which are not banded together can easily cause injury. ● Product which is banded together can exceed manual-handling lifting criteria.

Table 16 U frames



- There are various designs of these frames. They are usually used for temporary storage (eg picking activities or when banding/bundling) of long, narrow stock.
- Due to stability issues, this type of racking should not be stacked on top of each other.

Use/advantages	Hazards/risks/disadvantages
<ul style="list-style-type: none"> ● As these are usually manufactured in-house, the load bearing capacity must be assessed by a competent person. This capacity should be marked on the frame and not exceeded. ● Loading/unloading and picking areas should be clearly marked and segregated to ensure safe containment in case of U-frame weld failure. ● Frames should be regularly inspected for significant damage and welding cracks and repaired or replaced as necessary. ● There are various designs of these frames and simple design tweaks (see photographs) can substantially increase stability. 	<ul style="list-style-type: none"> ● U frames have inherent stability issues and handling using a crane or FLT can easily result in toppling of the frames. ● Historically, stacking of U frames was common practice but inherent instability, because of inadequate lateral strength/support, caused numerous serious incidents, some of which were fatal. This was more probable when storing heavy loads on higher levels and commonly occurred during handling activities although similar U-frame collapse incidents could occur with any loading characteristics. ● In the vast majority of cases, alternative racking (eg cantilever racking) will allow efficient, effective and safer handling.

Racking inspection and maintenance

72 In general, racking is manufactured from relatively lightweight materials and, as a consequence, there is a limit to the amount of abuse that it can withstand. The skill of mechanical handling equipment operators has a great bearing on the amount of damage likely to be caused. Any damage to racking will reduce its load carrying capacity. The greater the damage the lower its strength will be.

73 To make sure that a racking installation continues to be serviceable and safe, the storage equipment should be inspected on a regular basis. The frequency of inspections should be determined by a nominated 'person responsible for racking safety' (PRRS) and should be based on the operating conditions of the stockholder. This will take into account the method and frequency of operations together with the dimensions of the premises, the equipment used and personnel involved, all of which could affect likelihood of damage to the structure. The inspection regime follows a hierarchical approach using several levels of inspection.

Immediate reporting

74 As soon as a significant safety problem or damage is observed by any employee, it should immediately be reported to the PRRS. You should have systems in place for reporting damage and defects.

Visual inspections

75 The PRRS should make sure that racking is inspected at weekly or other specified, regular intervals based on risk assessment. A formal written record should be maintained. These inspections will normally be carried out from ground level unless there are indications of problems at high level that need further investigation. An example of a racking inspection report is given in 'Appendix 1'.

Expert inspections

76 A technically competent person should carry out inspections at intervals of not more than 12 months. A written report should be submitted to the PRRS with observations and proposals for any necessary action. A technically competent person might be a trained specialist within an organisation, a specialist from the rack supplier, or an independent qualified racking inspector.

77 The Storage Equipment Manufacturers' Association (SEMA) run training on visual inspection and maintenance of racking, and offer a formal course that qualifies racking inspectors (The SEMA Approved Inspector Qualification). See SEMA's website ¹⁵ for courses, current industry codes of practice for a range of racking systems and a list of SEMA approved inspectors.

78 Where damage is identified that is critical to the safety of any racking system, the racking should be unloaded as necessary and controls introduced to prevent it being used until remedial work has been carried out.

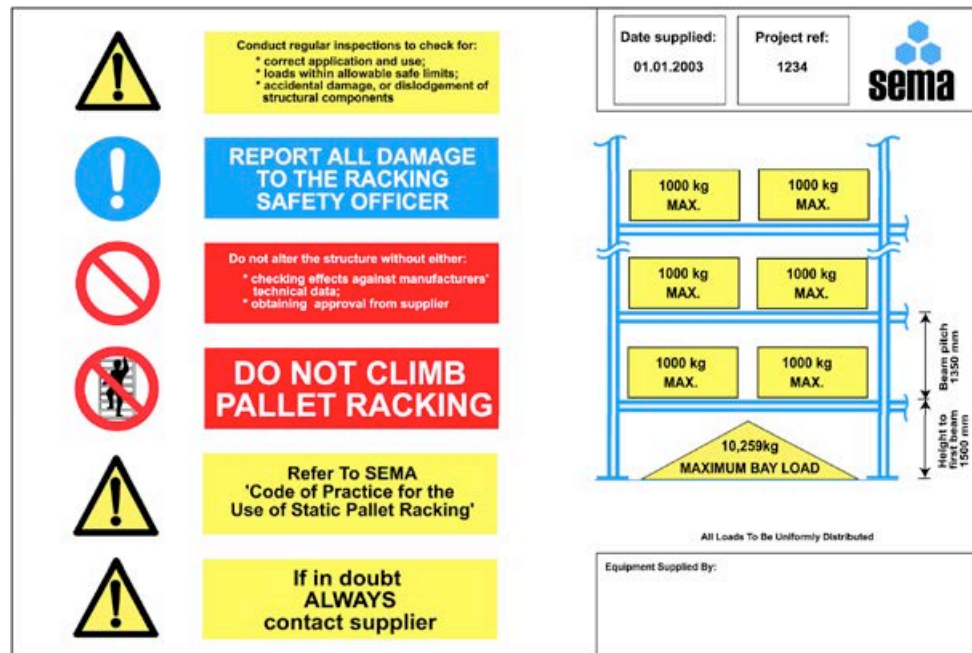


Figure 1 – Example of a Safety Notice (including Safe Working Load) notice for a static pallet racking. Note – the SWL’s for both the individual horizontal beams and the vertical bay loading should not be exceeded.

Free standing storage

79 Free standing storage for long products needs to be carefully risk assessed as stacks can become unstable and collapse. Take account of the dimensions (ie height and width) of the product, its inherent characteristics (eg shape, rigidity) and stacking pattern. Access (eg for slinging) should be designed into the storage areas so that employees do not have to climb onto or walk over stock and that time in and around stock is minimised. The risks are not only from stack collapse, but also from the slippery surfaces of metal stock once contaminated by water/oil etc. Floor/ground conditions must be level, solid, even and not likely to deform. Also consider any risks associated with impact or collision from handling equipment (eg FLT’s or cranes).

Case Study 4

A fork lift truck was being used to move bundles of tube product, which had just been delivered, into storage.

The bundled tube was being arranged in back to back rows inside the warehouse and stacked (up to five high) above head height, using wooden bearers of different sizes as separators. Banding of the bundles was questionable leading to ‘slump’ and instability. The FLT driver was placing the bearers between the bundles before placing the next bundle when the stack of bundles collapsed, trapping and killing the driver.

Root causes

- Free standing storage was not properly planned or controlled to safe stack heights (including back to back rows) and poor location of bundles was suspected between the rows.

- The wooden bearers used were odd pieces of wood of inconsistent dimensions.
- Banding regularly failed in transportation and during handling on site which should have fed back into the risk assessment to recommend other systems of stacking (eg not free standing).
- Together all these factors caused stack instability.
- Inadequate instruction and training of workers in safe systems of work, including safe storage and stacking height.

80 It is essential to use suitable bearers that will ensure adequate separation from the floor/ground and between bundles. Bearers should be of uniform cross-section and not made from brittle or soft material which is likely to break or distort. It is recommended that different products and sizes should not be mixed within the same stack. Bundles should only be stacked if failure of the banding would not result in the collapse of the stack.

Long narrow stock (for example bar, tube and narrow sections)

81 Free standing storage of long narrow stock should be avoided wherever possible as its inherent characteristics mean that stacks are likely to be unstable. This stock is best stored horizontally in storage racks (eg toast racking). Small-gauge material is more likely to sag if it is inadequately supported and to 'spread' if not bundled. Bundling or packaging this stock can reduce sagging and make stock-handling easier and safer, however if the banding were to fail, the bundle would become unstable and this product would also be best contained within a racking system. (See paragraph 63 for storage system choices). Where free standing storage is unavoidable, stack heights should be limited and other controls introduced to prevent stock collapsing.

Long, broad stock (eg columns and beams)

82 This product is most commonly stored in racking, however, it may be suitable for free-standing storage on the floor on bearers. Bundling may improve inherent stability and improve ease of handling and storage. Lifting is best suited to overhead travelling cranes and handling can be made easier and safer by the use of customised lifting accessories such as 'fish' plates (see Photograph 40) and 'splitting hooks' (see Photograph 41), subject to operating safe systems of work.



Photograph 3 Free-standing stacks of broad, long product on firm, level ground using wooden bearers. Note poor control of tripping hazards in access area

Coils

Narrow coils

83 Coils should be safely laid flat and formed into a stack. Pallets can be used to support stacks. Bearers should be placed between the coils to permit access for safe handling. The largest diameter coils should be located at the bottom of the stack and the smallest diameter coils at the top to aid stability of the stack. The overall stack height should be limited in order to control the risk of toppling.



Photograph 4 Free-standing stacks of narrow coils (bore-vertical) on suitable bearers on a solid floor. Individual coils are separated by bearers for safe/easier attachment of coil lifters or other handling equipment. The banding ensures the coil is maintained in shape.



Photograph 5 A stack of coils which are unsuitably stacked presenting instability



Photograph 6 The same coils but stacked safely with largest diameter at the bottom and smallest diameter at the top

84 Narrow coils behave like round coins – they are stable when laid flat (bore-vertical or eye-to-sky) but unstable when standing on their narrow edge (bore-horizontal). Free standing narrow coil should be stored bore-vertical only. On edge they can easily roll or be knocked over. If leant too heavily against a support they can slide away from it under their own weight (see Figures 2 and 3). If you need to store narrow coil bore-horizontal (eg for space reasons) then a suitable rack should be used (see Tables 13 and 14).

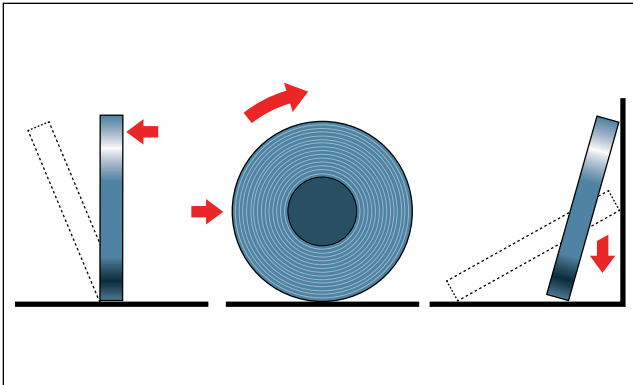


Figure 2 Narrow coils can move unexpectedly and cause crushing injuries



Figure 3 Operator crushed by collapsing narrow coils. Coils should always be properly supported and protected from moving vehicles

Broad coils

85 Broad coils are normally too large to be stored eye-to-sky due to handling issues, but when stored bore-horizontal they can roll. Once rolling, they are difficult to stop and are dangerous because of their large mass. They should always be safely chocked with adequate containment barriers installed at each end of the coil row. They should be stored on a stable (ie unlikely to move or settle), level surface and in a properly designated storage area with safe access for people and handling equipment.



Photograph 7 Substantial concrete barriers, with reinforcing bars sunk into the floor, for containing broad coils

Chocking broad coils

86 Broad coils can be stored single-level or stacked (see paragraph 90). Suitable chocking of the base layer is essential to prevent movement. The chocks should only be positioned while the coil is still attached to the lifting equipment. The chock should be properly located on a suitable stable floor surface with its longest surface in contact with the floor. Single-level rows of coils always exert lower forces on the chocks than stacks, so stacking should be avoided wherever possible. Unstacked coils are easier and safer to handle and are also less prone to damage.



Photograph 8 Not chocked

Photograph 9 Chocked

87 Stacks which rely solely on chocking for their stability and integrity should not be stored more than two high. For temporary storage, before the coil is consigned to permanent storage or where coil has to be moved for picking purposes to access a lower level, stacking coils more than two high may be permissible. However, additional precautions should be taken to prevent stack collapse and ensure the stability and integrity of the stack, eg additional strapping of coils or additional end column supports.

Note – There may be coil rack systems which are specifically designed to allow stacking of coils three or four high, where extra precautions are taken to ensure the robustness of the stack system, its integrity and stability. These systems do not rely on chocks alone.

88 Coils should always be chocked using properly designed and located chocks (see Figure 4). Chocks can be made of hardwood, steel or a composite material – softwood is unsuitable. They need frequent checking as they are subject to high levels of wear and can need frequent replacement. The chocks should be:

- triangular in cross section and have three sides of different lengths;
- large enough to prevent a coil climbing up and over the chock;
- designed with a chock angle (ie the angle between the floor and the coil) of between 20° and 28°;
- produced using the equation shown in Figure 4 to calculate the dimensions of the chock necessary for any coil radius that you store. Remember that 't' is the

thickness of the chock at the point which touches the coil. The chock thickness will actually be greater at the sawn end (t^1) and should be at least $1.5 t$, without causing the chock to extend beyond the width of the coil;

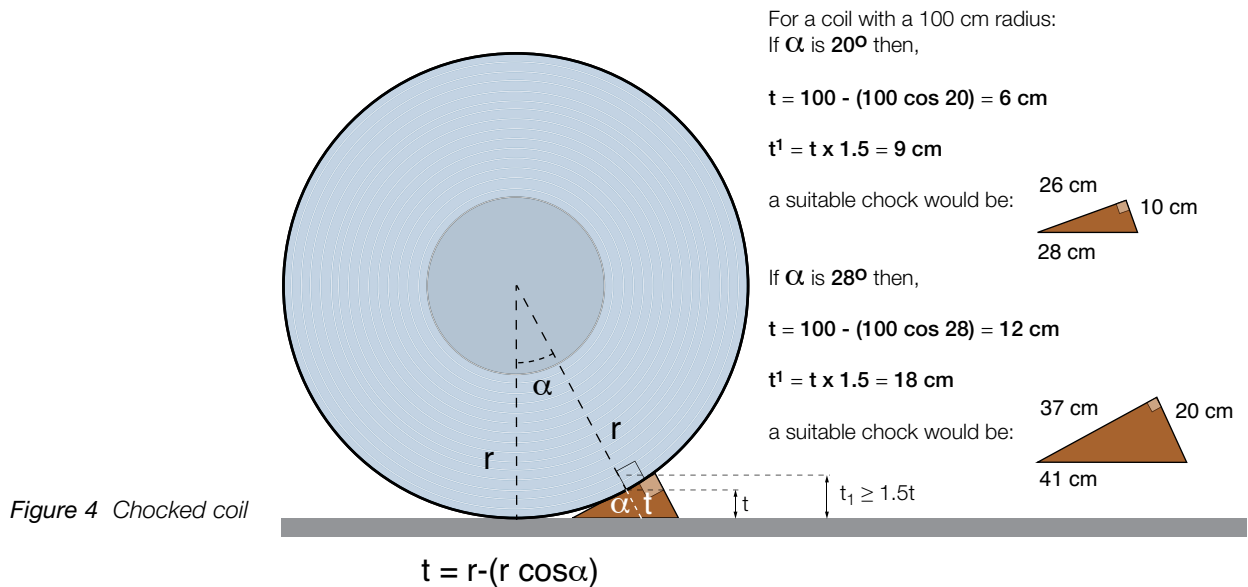


Figure 4 Chocked coil

- positioned so that the longest face of the chock is in contact with the floor/ground as this maximises the friction between the floor and the chock.



Photograph 10 The chock is placed incorrectly with the longest edge against the coil



Photograph 11 The chock is placed correctly with the longest edge on the floor

89 Additional relevant factors when using chocks:

- A minimum of two chocks should be placed on each side of the coil, equally about its centre line.
- The floor condition should be checked regularly to make sure that it is clean and free from contamination, eg by oil. If coils are oiled, then oil can leak from them and reduce the friction between the floor and any chocks, leading to stack failure and collapse; wooden chocks should not be used to support oiled coils.
- It is recommended to strap together the two adjacent coils at each end of the row to prevent unexpected movement.
- Substantial and suitably designed containment barriers or end stops should be positioned at both ends of a row or stack to prevent coils from rolling out of the storage area (see Photographs 7 and 12).
- Access routes and gangways should be provided on one/each side of every row of coils, to allow safe access for the use of lifting equipment.

- Lifting equipment should be designed to allow employees to work from a safe position, eg without entering a row of coils or reaching through a coil. Accessories such as C-hooks and coil grabs should be used and equipment operated from the gangways. Lifting equipment should be used by authorised personnel only.
- Supervisors should make sure that chocks and other equipment are fit for purpose, properly maintained and correctly used.
- Damaged chocks should not be used – an adequate supply of replacement chocks should be readily available.



Photograph 12 Solid uprights for containing stock, (eg chocked broad coils) within storage areas

Stacking broad coils

90 When stacking broad coils, the weight of material in the higher levels causes considerable downward gravimetric forces on the lower, base-level coils (see Figure 5). Such forces can cause stack failure and collapse if, for example:

- coils in the base layer 'climb' over the chock or support system (see Figure 6);
- a chocked base-level coil 'slides', pushing a chock along the floor (see Figure 7);
- there is a failure in the support system or one or more of the chocks;
- the chocks are not properly located and the correct way around;
- poor alignment of coils within a stack causes it to turn or distort;
- varying coil diameters are used in the base layer so that coils in the upper layers are stacked on differing heights of lower coils (causing upper layers to fall);
- coils are not tightly wound, causing them to sag and distort the stack.

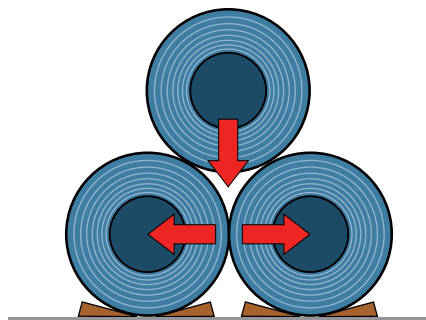


Figure 5 Forces in coil stacking

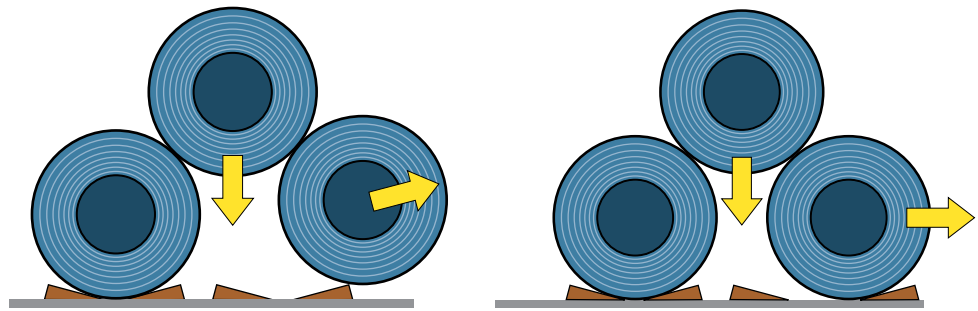


Figure 6 Failure caused by coil climbing over the chock *Figure 7 Failure caused by chock sliding the chock*

Rules for safe broad coil stacking (bore-horizontal)

91 When broad coil is being stacked:

- Stack heights should be as low as possible. Stacking higher than two coils high should be avoided wherever possible. Where higher stacking is deemed to be necessary (eg temporary storage before relocation into long term storage), suitable robust measures (eg a properly designed coil support system) should be put in place to ensure the stability of the stack. Arrangements should always be made to reduce the height of the stack at the earliest opportunity.
- Coils which have been oiled or pickled should not be stacked more than two high due to slippage risks.
- Coil stored outside should never be stacked more than one coil high unless additional precautions are taken to counter the additional risks from product degradation, changing climatic and ground conditions, and from associated handling issues.
- Stacks should be prevented from sliding, eg by placing fixed restraints at the ends.
- Every coil in the base row should be chocked on both sides using suitable chocks (see paragraph 88).
- The base level of coils should be adequately restrained. It is also recommended to strap together the two adjacent coils at each end of the base row to prevent unexpected movement as a result of downward pressure from coils in the upper row, thereby improving stack stability.
- Further additional precautions should be provided where coils are stacked more than two high (eg as temporary storage). This may include the addition of further straps between coils and/or further containment barriers.
- Coils should be correctly aligned and stacked so that the centre point of each coil is directly above the centre point of the rack or row (see Figure 8).
- The stack should be built with the bottom coils as close as possible to each other.
- Coil diameters in the base row should not vary by more than 10% to make sure that coils placed above them are secure (see Figures 9 and 10).
- If coils are removed from the stack (see Figures 11 and 12), replacement coils should be of the same diameter or no more than 10% smaller (see Figures 13 and 14). If this is not possible, either a gap must be left or the entire stack rebuilt.
- Coils which are partially unwound, which have broken bands or loose packaging, or which rest on dunnage, should not be block stacked.

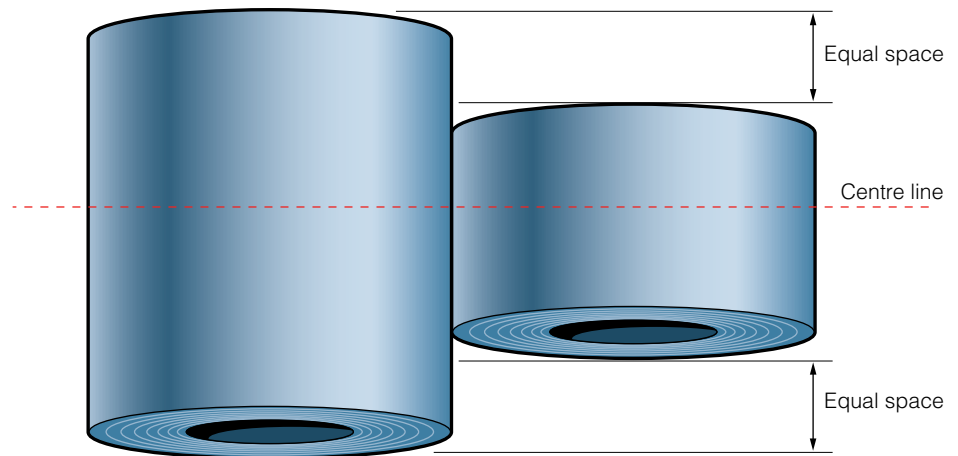


Figure 8 Correctly aligned coils

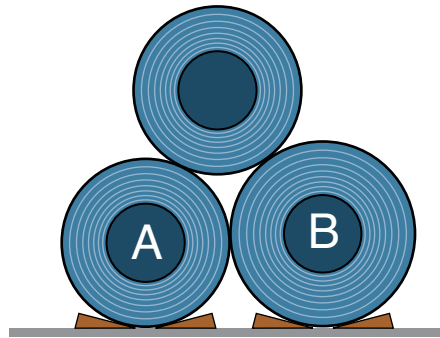


Figure 9 Diameters of coils A and B should not differ by more than 10% to permit two-high block standing

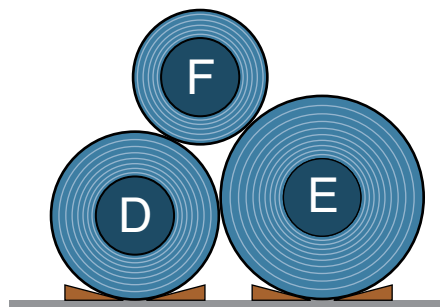


Figure 10 Diameters of coils D and E differ by more than 10% and two-high block standing is therefore unsafe, regardless of the diameter of coil F

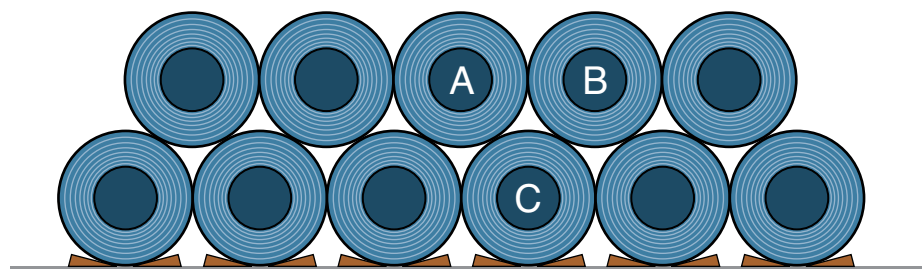


Figure 11 A complete block-stack before any coils have been removed

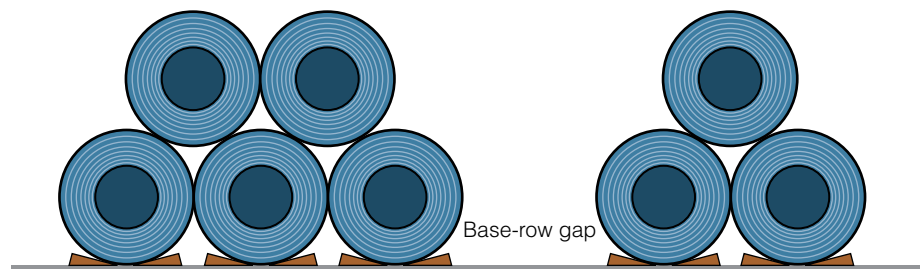


Figure 12 Coils A, B and C have been removed

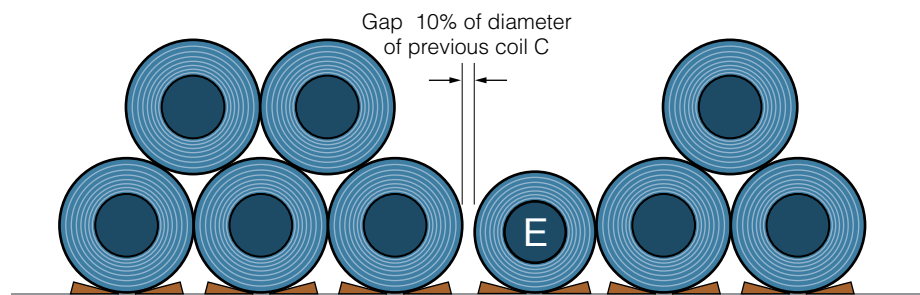


Figure 13 Coil E has been added, properly positioned and chocked. As it leaves a gap which is no greater than 10% of the previous coil's diameter, block-stacking may continue

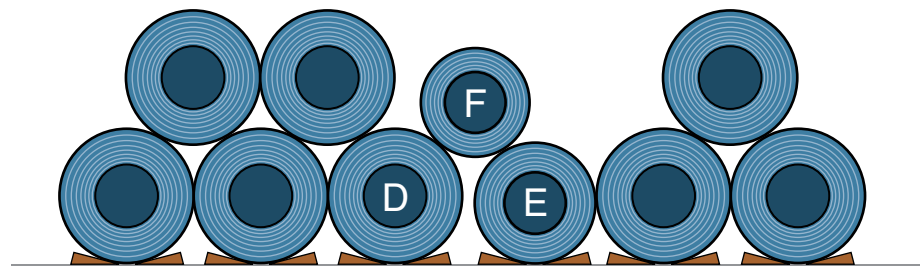


Figure 14 Coil F has been added, creating a block-stack without the need to rebuild the entire stack. However, the diameter of F must not exceed the diameter of D or E

Plastic coil supports

92 Coil supports made of recycled plastic (see Photograph 13) can be used to chock (and support) coils. They are often fitted into channels which help to maintain even spacing of coils. Although this system may have a high capital cost when compared to other systems, the supports usually have a long working life and require less frequent checks/maintenance. They are usually easier to use than other systems and may require less supervision. It is essential that frames are constructed so that they:

- hold/fix the supports correctly at a distance which matches the range of stored coil diameters and prevent coils from rolling;
- have closed ends to prevent supports from being pushed out of the frames;
- allow for the use of blocks between coil supports to prevent them from sliding;
- provide safe means of access (in the form of suitable routes and gangways) so that employees do not have to enter the racks. A gangway should normally be provided on each side of a row of coils;
- allow the use of suitable lifting equipment (eg C-hooks or coil grabs) so that employees can work from a safe position without entering or reaching through a row of coils;

- contain supports in a way that helps maintain some integrity if they are damaged. However, supports should be checked regularly and damaged supports replaced.



Photograph 13 Broad coil storage in plastic coil supports on floor-mounted inverted metal channels



*Photograph 14 Broad coil storage using floor-mounted inverted metal channels
Containment posts fitted to channel ends and clearly defined working areas and pedestrian routes*

Coil wells

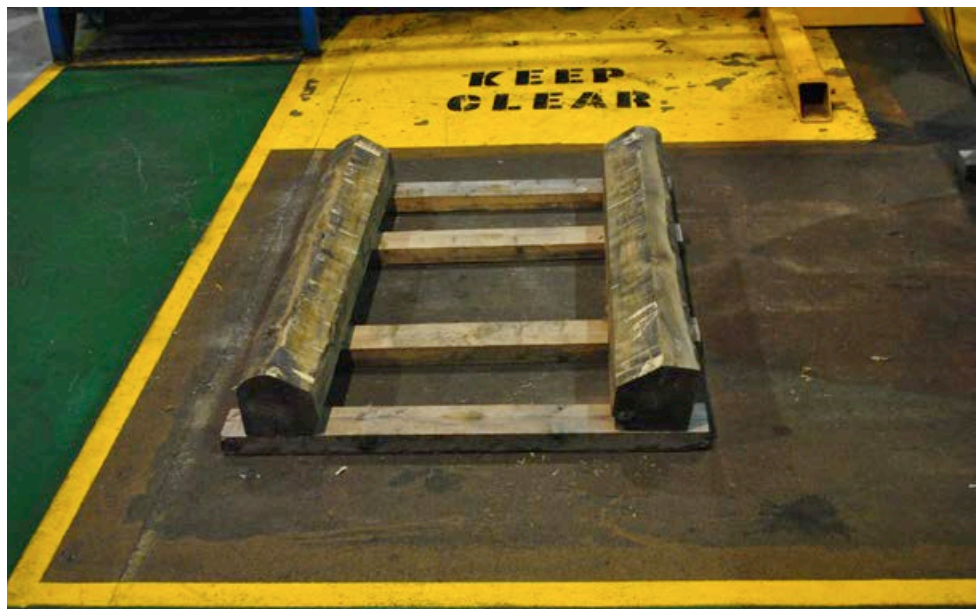
93 Coil wells are depressions in the floor which ensure the stability of the coil (see Photograph 15). They were originally installed to aid the containment of protective oils draining from coils but are becoming less common in the industry. Dimensions vary according to the stock. There are generally coil wells in the bed of lorries transporting broad coil to aid stability during transit.



Photograph 15 Concrete coil wells for broad and narrow coils

Cradles (chairs)

94 Cradles (chairs) are supports for individual coils and are usually made from wood or steel (see Photograph 16). They are sometimes (rarely) placed in rows to support the base level of a multi-level stack of coils. Sometimes the cradle is banded to the base of the coil. Suitable handling equipment should be attached to the coil itself for the purposes of lifting/handling. Fork-lift trucks can be used to lift cradles which are carrying coils, provided that the cradles themselves are designed to be handled in this way.



Photograph 16 An example of a wooden cradle

Sheet and plate

95 Plates and sheets are most stable when laid flat. When stacked on edge they should always be adequately supported in suitable racking (see Table 12)

which prevents them from falling over and enables safe retrieval of individual sheets (usually with specialist lifting accessories).

Free-standing horizontal storage



Photograph 17 Tidy and well-spaced, free-standing floor storage of plate; separation of small quantities of sheet by suitable bearers (battens)

Pallets

96 Sheet and plate can also be stored on suitable pallets of similar dimensions (see Photograph 18). Where possible, stock should be strapped to the pallet to aid safe handling and transportation.



Photograph 18 Sheet/plate banded onto pallets with minimal exposed sharp edges

97 Pallets are normally re-usable and made of wood, although pallets made of plastic and metal are available. They can be either two or four-way entry and reversible. They can be stored on the ground (and sometimes stacked) or on a pallet rack, subject to the safe working load of the individual pallet and pallet stack.

98 Pallets should be:

- of suitable design, robust and suitable for the handling equipment;
- capable of transferring the weight directly to the floor (or racking system);
- capable of safely bearing the load placed on them, particularly where there is uneven loading;
- of an appropriate size so that loads do not overhang the sides;
- maintained in a suitable condition for safe use, eg timbers of wooden pallets must not be split or damaged.

99 When using pallets:

- You should use appropriate lifting and handling equipment to manoeuvre them.
- Floors must be level and capable of taking the weight.
- Only tidy, evenly banded pallets should be stacked (to ensure stability) and safe height limits should be clearly defined.
- Stacks should be neat, vertical, level, and stable.
- Pallets must be properly maintained. Reusable pallets should be regularly inspected and maintained.

Box pallets

100 Box pallets vary in design but are essentially self-contained storage units comprising a base and support frame. They can be placed alongside coil-processing machinery to safely store coils awaiting use. Box pallets are not designed to be stacked, but can be located in pallet racking.



Photograph 19 Box pallet

Bearers (battens)

101 Bearers are used for a range of products to aid support and separation. They allow access for the safe connection and use of lifting accessories and equipment. Adequate space should also be provided around the material to enable easy access to attach lifting accessories. Correct positioning of bearers is essential. They should be placed above one another in a stack and care should be taken to avoid any overlapping between stacks which can cause one stack to collapse when lifting stock from an adjoining stack.

102 Bearers should be made from square section of a suitable resilient material so that stacks are always level. Bearers are sometimes placed in polythene bags to prevent rusting or other marking on the sheets or coil edges.



Photograph 20 Bearers

Banding

103 Banding is used to maintain the integrity of items during handling, storage and both internal and external transportation. Steel banding/wire is normally used, although plastic banding may be used for restricted cases where it has been assessed as suitable. Banding is intended to keep the load intact; it is not a lifting aid. Handling loads by their banding is likely to damage the banding, greatly increasing risk of its failure and collapse of the load.

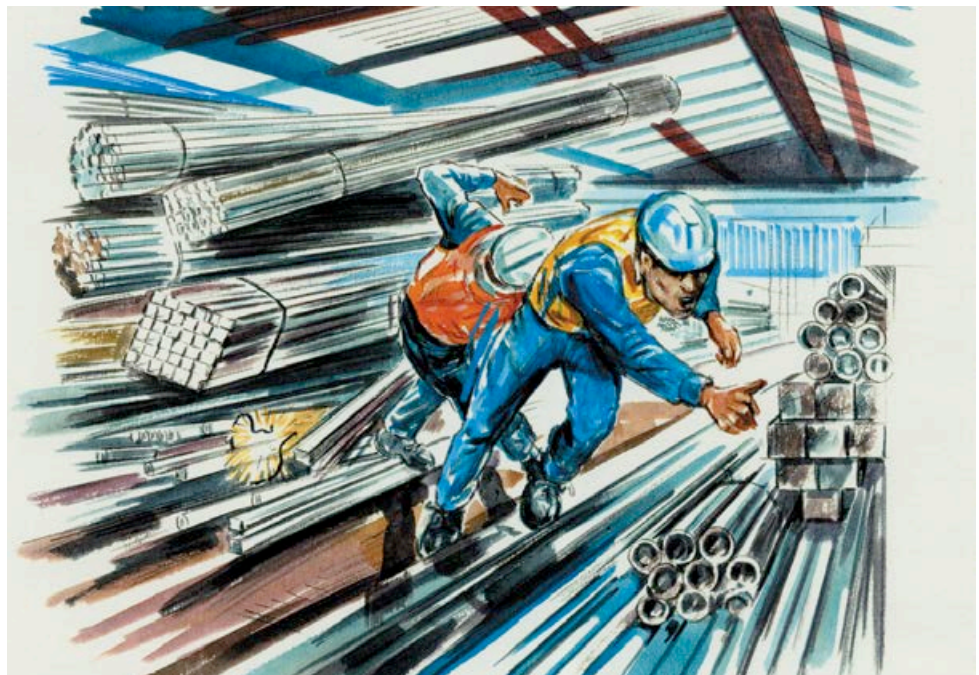


Figure 15 Failure of banding resulting in collapse of free-standing stack of bundles. No provision for containing collapsing stack safely. No protected aisles for operators to work from.

Case Study 5

As instructed, an employee was lifting bundles of tube by placing lifting hooks under the banding wire. One of the bandings failed, and the load fell and struck him, causing him serious injury.

Root Causes

Failure of banding material resulted from an unsafe lifting operation, ie lifting of a load by its banding. Poor risk assessment and lack of planning. Inadequate instruction and training to the operator in correct lifting procedures.



Figure 16 Collapse of bundle being lifted by banding.

104 The sharp edges of banding are a hazard with a significant risk of injury from cuts. Remember:

- there is a risk of injury if tension in the banding causes it or the product itself (eg coils) to spring back suddenly either when cut during splitting of bundles or in the event of unexpected breakage;
- hands, arms and face may be at particular risk and, where necessary, you should provide appropriate PPE;
- you should remove waste banding materials as soon as possible after breakage or cutting and place in a suitable container, eg a waste skip or bin.



Photograph 21 Banding strip on broad coil with warning sticker of 'spring-back' risks



Photograph 22 Damaged banding wire suggests that it was being used to lift the bundle

Storage Summary

105 For all storage systems you should always remember the following:

- Storage systems are work equipment and subject to the requirements of the Provision and Use of Work Equipment Regulations (PUWER).¹⁶ They should be suitable for their intended purpose (taking into account the intended handling system).
- The design should avoid the need for personal access within storage systems. Where this is not reasonably practicable, then the time spent working within storage systems should be minimised. Always make sure everyone is in a safe position when mechanical handling takes place.
- Safe access should be provided to all stacks to allow for the safe connection of lifting accessories to loads.
- Use an appropriate storage system for the material, taking account of any likely failure modes and avoid free-standing storage where there is any doubt about a product's inherent stability.

- Stock should be stored and stacked so that it is not likely to fall/move and cause injury. Mixed material stacks should be avoided.
- Floors should be stable, level and capable of taking the weight of the stock and any storage system. External ground conditions should be fit for purpose for external storage of stock.
- Storage systems should be properly installed, safely used, regularly inspected and maintained in a safe condition. You should make sure that all workers adhere to safe systems of work by providing suitable training, instruction and information and through management and supervision.

Handling

106 Stock is handled in two main ways:

- for movement on site, including placement into and retrieval from storage, and when processing materials;
- for delivery vehicle unloading and loading.

Handling materials on site, including lifting operations

107 Handling involves routine and one-off lifting operations which are subject to the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER).¹⁷ Lifting operations must be:

- properly planned by a competent person;
- appropriately supervised;
- carried out in a safe manner.

108 For more general advice on lifting activities see the Planning and organising lifting operations webpages on the HSE website.¹⁸ For manual handling advice see paragraph 236.

109 Lifting operations can often put people at great risk of injury, as well as incurring great costs when they go wrong. It is therefore important to properly resource, plan and organise lifting operations so they are carried out in a safe manner. Each of these elements requires a person or persons with sufficient competence to be involved at each step. These people should have sufficient theoretical and practical knowledge of the work and equipment in question, as well as the requirements of the law, to be able to do this properly.

110 For straightforward, common lifting operations, a single generic plan could be part of the normal risk assessment for the activity. From time to time you may need to review the plan to make sure that nothing has changed and the plan remains valid. Lifting operations which are a little more complex may, depending on the circumstances, need to be planned each time the lifting operation is carried out.

111 The plan for any lifting operation must address the foreseeable risks involved in the work and identify the appropriate resources, including the number and skills of people, necessary for safe completion of the job. The plan may include any or all of the following:

- working near suspended loads
- visibility (over the full path of the load)
- attaching/detaching and securing loads (especially access)
- environment (including external conditions, eg ground and climate)
- location (access and egress)
- alignment of the lifting equipment with the storage system and product
- overturning (eg of FLT's or mobile cranes)
- proximity hazards (eg racking and other work equipment)
- derating of equipment (eg magnets)
- overload (eg possible 'shock' loading)
- pre-use checking (to ensure equipment is safe to use)
- continuing integrity of the equipment (maintenance, including adequate storage)

112 The plan should set out clearly the actions involved at each step of the

operation and identify the responsibilities of those involved. The degree of planning and complexity of the plan will vary and should be proportionate to the foreseeable risks involved in the work.

Case Study 6

An employee was standing on a stack of bundled long product while trying to attach a lifting accessory. He lost his footing, fell and was seriously injured.

The root causes

- This fall from height was due to inadequate planning of the lifting operation and an unsafe means of access to attach the lifting accessory. An unsafe system of work created an unsafe place of work.
- The employee was inadequately instructed and trained.
- There was inadequate supervision and poor risk management.

How to ensure lifting operations are safe

113 Lifting operations in stockholders that have resulted in serious incidents have shown that the following factors should have been identified in the lifting plan, and measures taken to address the risks:

- Lifting equipment and lifting accessories must be suitable for the task.
- Adequate information should be obtained from the equipment manufacturer and provided to the user so they know how to use and maintain the equipment safely.
- Safe working loads must not be exceeded.
- Safe systems of work must be followed, for example to avoid the need for employees to enter danger areas or to reach between unstable or poorly supported materials to attach slings etc.
- A safe place of work must be provided. For example, anyone attaching lifting accessories to stock (slinging) must be able to do so in safety and must be in a safe position when the load is lifted.
- Banding wire or straps should never be used for lifting stock.
- Suitable dunnage/bearers should be used to separate load components and give sufficient clearance for safe attachment of lifting accessories.
- Any person using lifting equipment must be suitably trained and instructed (see Paragraphs 31–38).
- Cranes should only be used for vertical lifting and not to pull or drag stock out of storage racking, as the excessive loads can damage the crane and/or racking.
- The height at which loads are raised should be kept to a minimum.
- Loads should never be carried or suspended over personnel.
- All persons (operators and other people) should be in a position of safety where they are not at risk of being struck by the lifting equipment, the load being lifted or by falling material in the event of equipment or load failure.
- Visiting drivers should also have a designated safe area where they can observe the loading/unloading process as necessary in sight of the lifting equipment operator.

Photograph 23 Lifting operation of bundled narrow coil using a C-hook. Coils are banded together to improve stability

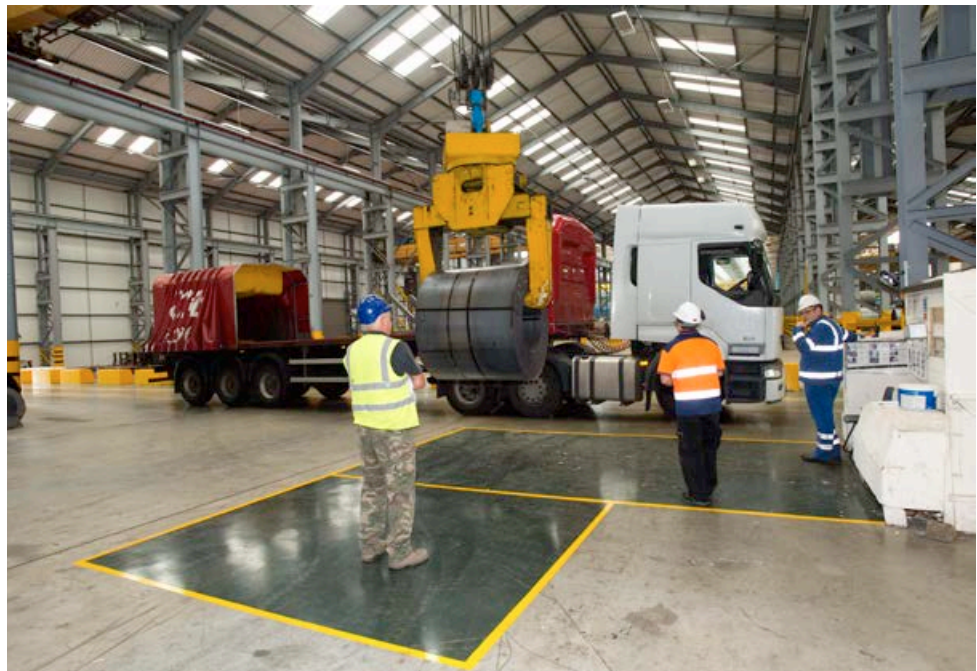
Supervision

114 Supervision should be proportionate to the risk, taking account of the competencies and experience of those undertaking the lift. Many everyday lifting operations do not require direct supervision (eg experienced crane operators undertaking routine lifts). There may be circumstances where supervisory assistance is required to manage risk (eg lifting an unusual load). Additionally, from time to time, employers need to monitor the competence of workers undertaking lifting operations to ensure they continue to be carried out safely.



PPE in lifting

115 When carrying out lifting and handling operations, there will always be some residual risk that PPE can help to protect against or can help reduce the severity of any injury. PPE such as head protection, safety footwear and gloves will generally be required. This PPE is not meant to protect an individual from a catastrophic event, such as a load falling from lifting equipment, but it may provide some protection against minor incidents such as handling steel with sharp edges or losing grip on stock during manual handling.



Photograph 24 Driver (in foreground) standing in a defined safe area and still able to observe the unloading operation

Lifting Equipment

116 Metal stock comes in numerous shapes and sizes and there are various types of lifting equipment and accessories available. All lifting equipment and accessories must be:

- of suitable design and construction (ie fit for purpose) and clearly marked with their SWL (also known as the working load limit WLL);
- used in accordance with the manufacturer's instructions for its intended use and with any training/instruction;
- examined by a competent person at prescribed regular intervals (see Table 17) and in accordance with a written scheme of examination;
- maintained so that they are safe for use.

Cranes

117 Several types of crane are used in stock-lifting operations.

Overhead travelling cranes

118 There are two broad types of overhead travelling crane, twin-hoist cranes and single-hoist cranes. They may be fitted with infra-red or radio-controlled operating devices to enable operators to stand further from the load than when using a conventional pendant.

119 Twin hoist cranes are preferable for long and/or flexible product. They can greatly reduce the need for slingers to enter storage racks or climb and walk on stored product, particularly if there is access to both ends of the stock.



Photograph 25 Use of twin hoist crane for lifting long product. Each hoist is operated independently and remotely



Photograph 26 Load is inclined by outermost hoist. Inner hoist's lifting chain is moved towards the opposite end



Photograph 27 Hoists linked together to effect horizontal lift out of racking. Crane operator is at a safe distance in a protected gangway throughout

120 Your risk assessment will determine when single hoist cranes can be used safely. The issues to consider include the load/product (flexibility, profile and length), storage system, safe access, sharp edges, oil contamination, slinging method, hoist capacity and the inherent instability of one point lifting. Single hoist cranes may require the use of accessories such as spreader beams (see paragraph 138) for lifting large and/or long items or using tag lines for manoeuvring loads safely.

121 The use of tag lines is much safer than guiding objects by hand or foot which has become habitual behaviour in many experienced operators in the industry. Operators mistakenly believe that using a hand or foot will steady the load while in practice, only the correct use of the crane controls will fully achieve this safely. Anyone using a tag line should not get too close to the load or move into a dangerous position. Consider whether the crane operator can safely use the tag

line at the same time as operating the crane controls. If not, a second person will be required. Tag lines should be attached to the load at ground level where possible or attached when safe to do so (ie not at an unsafe elevated level). Push sticks or poles can also be used to manoeuvre loads safely.

122 Loads sometimes need to be moved through 90 degrees when moving between delivery, storage or processing areas. The crane design or provision of slewing attachments can make this activity much safer, preventing personnel from being too close to elevated material and reducing the need for tag lines, or push sticks. The need for slewing should be avoided, where possible, by adequate design and layout of the storage systems, including the orientation of cranes relative to stock.



Photograph 28 Bundle of long product being lifted by an overhead crane. The operator is in a safe position, using a tag line to manoeuvre it into position

Safe use of pendant and remote controllers

123 Most overhead travelling cranes are now controlled by either pendant or remote control (ie radio or infra-red). It is imperative that inadvertent or incorrect operation of these controls is prevented. The following principles should be observed:

- Isolate power to the crane when not in use.
- Do not rest a pendant controller on any surface when not in use. Always allow the controller to hang down below the hoist correctly or place in a safe storage location.
- Operate the emergency stop button (E-stop) if the controller is to be left unattended.
- Where multiple cranes/hoists are in operation, each crane/hoist and its controller should be matched and suitably labelled (eg colour coding or numbering).
- Reserve/spare controllers may be capable of operating different cranes/hoists. Suitable arrangements should be made to authorise their use (eg during maintenance) and ensure that only one controller can be used at any one time (eg exchange and secure storage of controllers).
- Label the underside of the hoist to indicate orientation. Often they are labelled with a picture showing the points of the compass (N, S, E, and W) but there are other alternative means of labelling. These should be replicated on the controller.

- Remote controllers may be prone to inadvertent operation if operational instructions are not followed (eg a harness worn within tight spaces or a remote tucked under the arm).
- Only use gloves which don't inhibit the safe use of the operating buttons.
- Keep the batteries of remote units charged (and provide spare batteries as necessary).
- Ongoing maintenance/inspection of the pendant/remote control is essential to ensure ongoing safe use, for example:
 - daily pre-use checks should be carried out to ensure all functional control is correct;
 - the controller is clean (free from oil/grease) and the button labels are legible;
 - all button shrouds (plastic or rubber shrouds) are in place to prevent inadvertent operation.



Photograph 29 Remote control for overhead crane in general good condition but with some worn labelling of control buttons



Photograph 30 Harness type remote control in clean condition with suitable directional labelling



Photograph 31 Corresponding labelling on crane to remote control in Photograph 30

Vehicle-mounted cranes

124 These are used for loading or unloading stock from and onto delivery vehicles. Because of differences in operation, eg the use of outriggers etc, operators of this equipment should receive separate and specific training on their safe use. It should not be assumed that people trained to use other cranes will necessarily be competent to use vehicle-mounted equipment.



Photograph 32 'HIAB' crane mounted on a delivery vehicle



Swing jib cranes

125 Usually pendant operated, swing jib cranes are used for diverse operations including loading stock onto vehicles or machinery.

Photograph 33 Swing jib crane being used with a small spreader beam

Mobile cranes

126 These are often used for handling long product in external storage yards where overhead or gantry cranes are not provided, or on areas of uneven ground which makes the use of counterbalance fork lifts trucks difficult.

Lifting accessories

127 There are numerous proprietary accessories available for use with the different types of stock. Newly purchased equipment should always be CE marked indicating it has been designed and manufactured for a specific use. The use(s) will be specified in the instructions that come with the equipment and it should not be used for any other lifting activities. It is always recommended that you discuss your lifting requirements with the lifting accessory supplier or other lifting expert.

Long product handling accessories

128 These include:

- chains/slings (including web slings);
- electromagnetic devices;
- FLT fork extensions;
- beam clamps;
- spreader beams for crane or FLT;
- fish plates and splitters.

Chains/slings

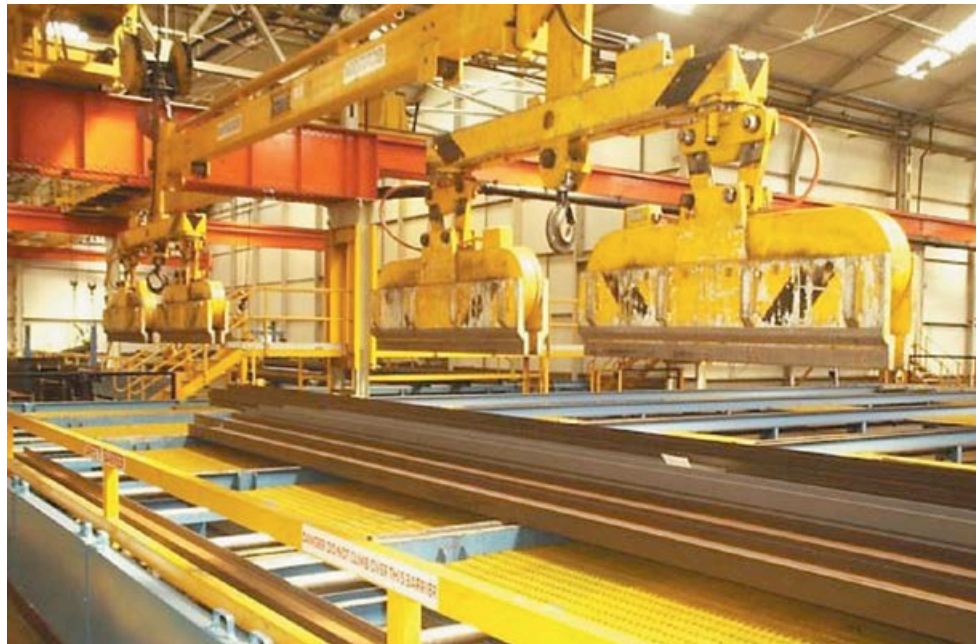
129 These contribute to safe lifting because the operator can stand at a safe distance once the slings have been attached to the load. Where someone has to climb/access stock to attach slings, the risk of crushing (from moving stock, both deliberate and inadvertent) or falls from height must be assessed and suitable precautions taken to prevent the risk. This might involve the use of other lifting accessories during the planned lift. For example, when handling long product using chains and slings with a single hoist crane, a spreader beam will also be needed (as specified in your risk assessment and lifting plans).

130 Some web slings are designed for restricted use, often referred to as 'single use' slings. If delivered stock is found with these web slings attached they will already have been used during the importing/unloading of this stock. These slings should not be used again and should be cut up and disposed of to prevent further use.



Photograph 34 Web sling lifting long tube product using twin hoist crane.

Electromagnetic devices (including magnets/magnetic cranes)



Photograph 35 Magnet lifting equipment for broad, long product. Personnel-free area where magnets are being operated

131 Electromagnets in the form of a single magnet or a group of magnets suspended from chains or wires or attached to lifting equipment in another way can be used for lifting and transporting steels and most ferrous materials.

132 Where the magnetic device can be taken on and off the crane, these are considered to be lifting accessories and are therefore, subject to LOLER thorough examination at least every six months. Where the magnet is an integral part of the crane it is considered to be part of that lifting equipment and therefore, its LOLER thorough examination should be every 12 months. Alternatively, a competent person can draw up a written scheme of examination covering either case.

133 Magnetic lifting devices should only be used for their specific designed and manufactured purpose. As with any elevated product, appropriate risk control measures should be in place to protect people, plant and equipment from the risk of falling material. Where magnetic lifting devices are used, safe working practices and safe operating procedures should be prepared and kept readily available for each type of material. Only those who have undergone specific training in the use of these devices should be authorised to operate them.

134 More detailed advice on the measures required to ensure safe lifting with magnets are detailed in *Guidance on the safe use of magnetic lifting devices*.¹⁹

FLT fork extensions

135 Loads should not be lifted on FLTs where sagging of the product creates an obvious risk of product slippage. Fork extensions are an attachment which reduces this slippage risk. The attachment should always be fixed to the forks/mast structure as specified by the manufacturer. Loads should be balanced with the main proportion of the weight applied to the central truck forks and the outer forks stabilising the load. There are other specialised FLT attachments available and, in all cases, specific manufacturers' instructions should be followed. This may include the derating of the fork lift capacity.



136 The FLT attachment shown in Photograph 36 is not practical for indoor use, as this would require wide internal aisles and doorways. Similar attachments are available for side loader FLT's for use indoors or where space is limited.

Photograph 36 Fork lift truck fitted with four-fork attachment. These can be used for carrying long, narrow product or plate/sheet

Clamp

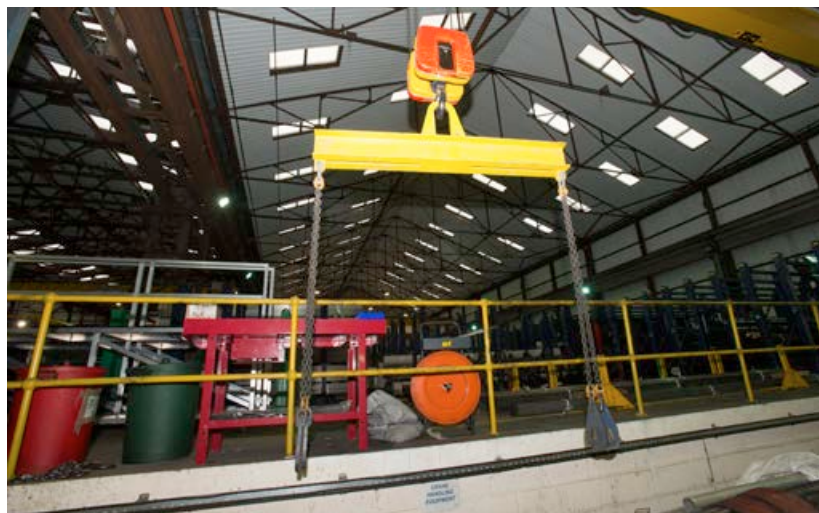
137 These are also known as 'beam clamps' and are used to lift long broad product. The profile and size of the clamps should be appropriate for the beam(s) to be lifted to allow correct seating on the beam flange. Side load should not be applied to the clamp unless it has been designed for this purpose and beam clamps are generally used in pairs with a lifting or spreader beam. Beam clamps are also available which rotate long product during lifting. A vertical beam clamp is sometimes used as a 'splitter' to separate bundles. The clamp should always be locked on to the product.



Photograph 37 Beam clamp

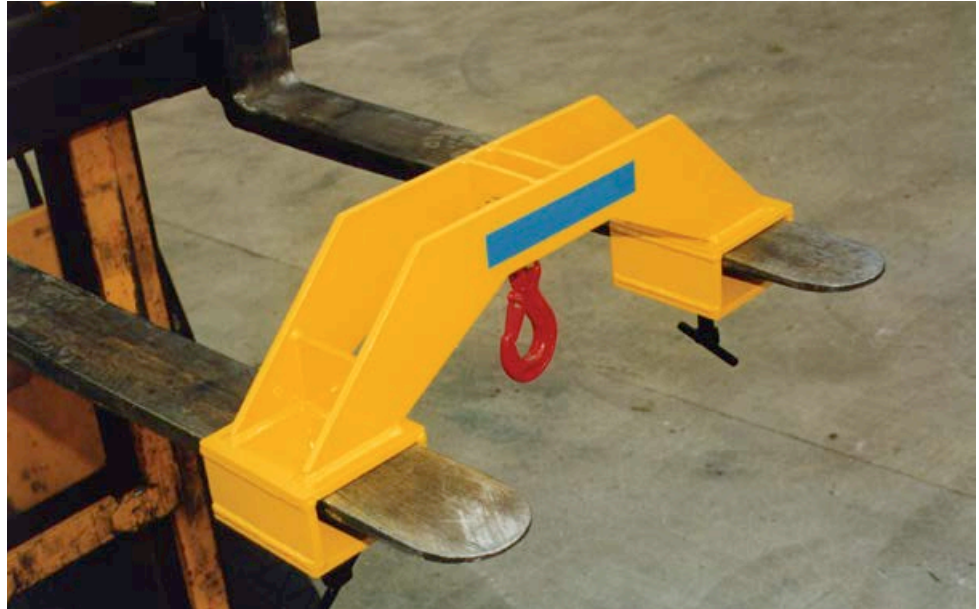
Lifting and Spreader beams (for crane or FLT)

138 Lifting and spreader beams are designed to allow the safe lifting of long product. Many are designed for specific purposes and use outside of these parameters is likely to be unsafe. You should check with the original supplier. The weight of the beam (and any attachments) must be included in the calculation of the safe working load of the lift. You should also allow for adequate clearance height when carrying out the lift. For stability reasons, avoid attaching the lifting beam at points below the centre of gravity of the load. Tag lines (paragraph 121) will aid lifting with spreader beams.



Photograph 38 Lifting beam with chain attachments and lugs for lifting waste skips

139 A beam type attachment can be installed onto the forks of a FLT, however, this converts it into a crane (now single point attachment). The attachment should be fastened to the forks in accordance with the manufacturer's instructions. They are usually provided with a universal swivel safety hook. Operators should have additional instruction in how to use this equipment safely taking into account the manufacturer's instructions on what precautions are required.



Photograph 39 Beam attachment fixed onto forks of a FLT

Fish Plates and splitters

140 Fish plates and splitters are used to lift one end of a product or stable stack of products, allowing larger bundles to be split and separated for lifting purposes. This often involves positioning battens between the products being separated to allow a chain sling to be attached. The hoist must always be positioned directly above the fish plate or splitter as they are not designed for non-vertical lifting and can easily slip, resulting in sudden movement of the product and the risk of a crushing injury.



Photograph 40 Using a fish plate to lift long broad product



Photograph 41 Using a splitter bar to allow safe positioning of bearers and attachment of lifting accessories

Coil-handling accessories

141 These include:

- C-hooks;
- telescopic coil lifters;
- coil turn-over units;
- horizontal coil lifters or vertical lifting tongues;
- crane-mounted up-ending grabs;
- boom FLT attachments.

C-hooks

142 C-hooks are versatile and can be shaped to handle large or small and single or multiple coils. They:

- allow coils to be handled without the need for anyone to place their hand(s) between adjacent coils;
- are often used to handle coils on horizontal supports; there should be gaps in the top surface of the support to allow safe positioning of the hook.

143 There are several different configurations of C-hook design. Operators should be instructed in the safe use of different C-hook designs and their specific applications. These include:

- A 'twin arm C-hook' for lifting coils in areas where space is at a premium.



Photograph 42 C-hook accessory for narrow banded coil



Photograph 43 Turning C-hook which enables coils which are lying flat to be lifted to the vertical plane.

- A 'turning C-hook' which enables coils which are lying flat to be lifted to the vertical plane. There is a minimum and a maximum coil width to be considered when using turning hooks. A 'turning shoe' is required to turn a coil from vertical to horizontal with a turning c-hook.

144 Due to the inherent instability of C-hooks when positioned upright, suitable storage arrangements are important, eg storage beams (see Photograph 44). There have been several fatal accidents where hooks have been stood upright and subsequently been knocked over by other activities, crushing or trapping the crane operator against other coils or fixed parts of the storage system.



Photograph 44 Storage beams for C-hooks

Telescopic coil lifters (man-saver or double acting grabs)

145 These are sophisticated coil-handling machines which allow control of the lifting operation from a safe distance (the safe distance should be indicated in your lifting plans). They are powered double C-hooks which are used to lift larger coils. Universal pivots are normally fitted to allow coils to be rotated during the lift.



Photograph 45 Telescopic coil lifter for broad coil

Coil Turn-over units

146 These come in a variety of forms and are used to lift and turn coils through 90 degrees. They can be used to turn coils which are lying bore vertical (eye-to-sky) to bore horizontal or vice versa. They can be designed to grip the inside of the bore, the outside of the coil, or both simultaneously.



Photograph 46 Unit for turning coil from bore-vertical to bore-horizontal (and vice versa)

Horizontal coil lifters or vertical lifting tongues

147 These accessories are used for lifting through the bore of narrow coils, either singularly or in multiples (but never exceeding the WLL). Planning the safe use of these accessories is essential:

- Ensure that suitable battens of uniform cross section are correctly positioned (on either a floor or on a stack of coils).
- The 'tongues' should be locked in position before any lift is initiated.
- Coils lifted by this accessory should always be banded to prevent unwinding of the coil.



Photograph 47 Horizontal coil lifter raising narrow, bore-vertical coil

Boom FLT attachment

148 As with other FLT attachments, this should be securely fixed to the forks/mast structure. The weight of the attachment itself must be taken off the rated safe working load of the truck to determine the overall safe working load.



Photograph 48 Boom attachment for handling coil

149 FLT booms should only be used to lift coil within its derated capacity. This boom attachment must not be used to lift single tube as this may compromise the lifting centre of the FLT. Additionally, the boom should not be used to lift tube bundles as this would effectively rely on the banding for lifting. Banding can only be used for containing the bundle.

Plate/sheet handling accessories

150 These include:

- plate clamps (vertical and horizontal);
- magnets;
- plate spreader beam;
- plate/sheet lifters or lifting dogs;
- vacuum lifters;
- forks.

Plate Clamps (vertical and horizontal)

151 There are several types of vertical plate clamps available. The basic version is designed purely to lift in the vertical plane for example from one toast rack to another. Other designs can take plate or sheet through 90 degrees, eg from vertical to horizontal, or through 180 degrees (ie upside down).



Photograph 49 Vertical plate clamp in use

152 There are also heavy duty vertical clamps (also known as 'hinged' or 'side loading' clamps) which can rotate the plate through 90 degrees (attached at the side and moving to the vertical position).

153 Horizontal clamps are usually designed to be lifted in pairs and lift plate only in the horizontal plane (ie from one horizontal location to another). A cam grips the plate and is used in conjunction with a chain sling to ensure the geometry of the lift and the correct application of the cam gripping forces. For larger plate, at least two pairs of clamps and a spreader beam should be used.

154 It is important to check the condition of the clamp, including its locking mechanism. Chipped teeth in the locking mechanism are common because of poor positioning of the plate (ie not at full depth into the 'throat' of the clamp). Damaged or worn clamps should not be used. The lever should be checked before a lift commences to make sure it is in the locked position.

155 Lifting in the wrong plane can result in serious injury. Clamps rely on friction for grip to hold the plate, so anything which may reduce that grip (for example rough surface finishes, loose surface scale or oily surfaces) should be avoided. It is not advisable to lift a plate using only a single clamp unless the product is of sufficiently small dimensions. The manufacturer's guidance on operating criteria should always be followed; this will include minimum and maximum thicknesses, rated capacity and SWL. This information should be displayed on the clamp. Where vertical plate clamps operate using friction, a minimum working load limit should be established.

Figure 17 Struck by falling material after failure of plate clamp. Loads should not be moved over people working below. Plate clamps should be maintained and properly positioned

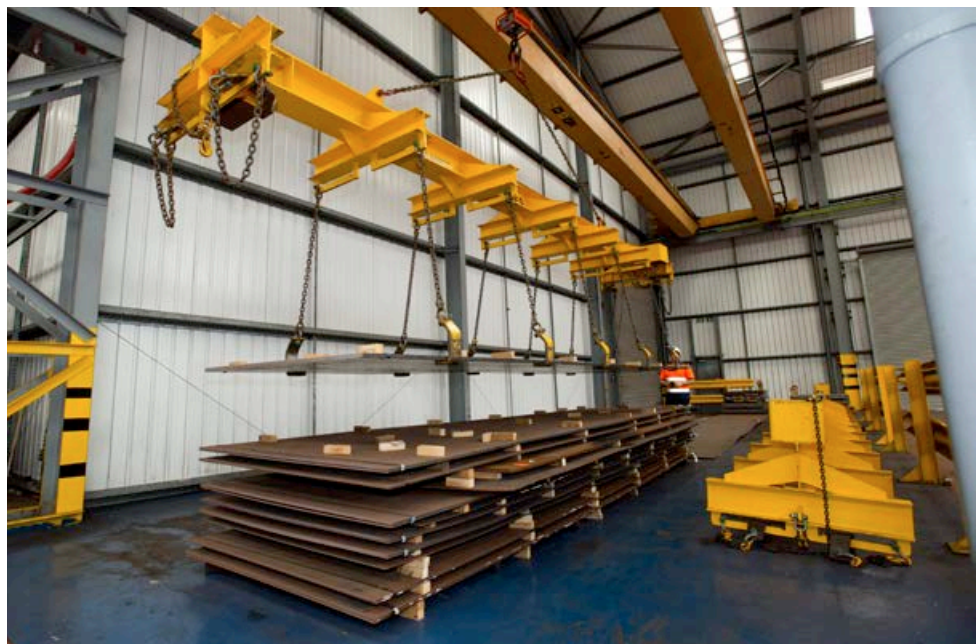


Magnets

156 Magnets are available in different designs and for different purposes, including for changing the aspect of the sheet/plate. The principles of using magnetic lifting devices are covered in paragraphs 131–134.

Plate spreader beams

157 Plate spreader beams are designed to allow the safe lifting of long plate. Many are designed for specific purposes and use outside of these parameters is likely to be unsafe. You should check with the original supplier. The weight of the beam (and any attachments) must be included in the calculation of the safe working load of the lift. You should also allow for adequate clearance height when carrying out the lift. For stability reasons, avoid attaching the lifting beam at points below the centre of gravity of the load. Tag lines (paragraph 121) will aid lifting with spreader beams.



Photograph 50 Large plate spreader beam

Plate/sheet lifters or lifting dogs

158 These are made up of simple hooks that reach under and support each side, or all four corners, of the plate. The rated capacity should not be exceeded and the height of stack lifted should not exceed the height of the lifter's upright, or vertical, section. The maximum height of stack that can be safely handled should be indicated on the plate lifter. There are also powered, telescopic versions known as auto-dogs.



Photograph 51 Plate lifter for large plate or bundled sheet



Photograph 52 Telescopic dog lifting equipment

Vacuum lifters

159 These can be used to lift individual plates but cannot be used to lift porous or perforated materials.



Photograph 53 Multiple suction cup vacuum lifter for lifting plate/sheet

160 The following safe working practices should be considered for inclusion in any operating procedures for the use of vacuum lifting equipment.

- Use vacuum lifting equipment for handling single items for which it is designed. Do not use vacuum lifting devices to handle loads for which it is not designed.
- Fully assess the risk of items being lifted becoming detached. Do not exceed the safe working load (SWL).
- Always follow the manufacturer's instructions.
- Always ensure that the automatic warning devices (audible and visible), which warn of a mains power failure, are checked before the starting a lifting operation.

- Ensure that there is good vacuum between the surfaces of the suction cups and the load. Vacuum efficiency could be affected by any damage to the suction cups.
- Prevent unauthorised access into lifting zones, especially at automatically controlled processes. Provide operators with safe places of work to ensure that they cannot be struck by displaced loads, eg provide guarding.
- Do not transport a vacuum lifted load where there is a risk of injury to any person if the load, or part of it, were to fall off. All movement of materials should be properly organised and managed to prevent injuries and damage to plant and key services. Travel routes should be clearly defined and maintained.
- Transport loaded vacuum pads at the lowest height possible, where practicable no higher than 1.5 m above ground level. Where this is not practicable, other precautions should be considered.
- Prepare arrangements for dealing with emergencies, eg action to be taken in the event of power/equipment failure, displaced loads etc.

161 Only people who have undergone specific training in the use of vacuum lifting devices should be authorised to operate them. For detailed guidance see HSE's webpages on vacuum lifting equipment.²⁰

Crane forks

162 Crane forks can be used to convert a crane into a fork lift truck which then allows lifting of palletised sheet material. A safety hook should always be used to connect the fork accessory onto the crane.

Storage of lifting accessories

163 Many lifting/handling accessories are themselves very heavy; serious accidents have occurred when free-standing attachments, such as large C-hooks, have fallen over and crushed personnel. All lifting and handling accessories should be safely stored when not in use, to prevent accidents and avoid the risk of damage to the lifting accessory. See also paragraph 144 and photo 44.



Photograph 54 Manual balance crane forks



Photograph 55 Storage rack for lifting attachments

Fork-lift trucks

164 Fork-lift trucks are widely used for lifting and moving stock. They come in a variety of sizes and types (either rider- or pedestrian-operated), the counterbalanced truck being the most commonly used. Smaller electric trucks are best suited to indoor use, larger diesel-powered trucks for outdoor use. See also HSE's website which contains detailed information on the use of lift trucks.²¹

165 Lift trucks have been involved in many serious incidents with many fatal injuries. Employers should ensure the following procedures are in place:

- ensure adequate training of operators;
- ensure adequate segregation of moving trucks from pedestrians;
- use an appropriate type of truck, for example use pedestrian-operated where rider-operated trucks might present a risk and side loader trucks for long product;
- use other lifting/handling equipment (eg overhead cranes) where appropriate, eg for very long stock;
- ensure adequate maintenance is undertaken;
- make sure the safe working capacity of the truck is not exceeded at the specified load centres and lifting height;
- ensure doorway openings are large enough to allow unimpeded travel of the truck and its load;
- set parameters for safe use of lift trucks and don't allow their use for other operations/products;
- only use lifting accessories that are appropriate for the task;
- provide lap restraints (and ensure they are used) where there is a risk of the FLT overturning (eg on uneven surfaces)
- consider rough terrain vehicles for use outside;
- make sure the working environment is safe and consider ground surfaces, visibility, traffic routes and adequate working space free of obstacles.

166 Side loader trucks are widely used for handling long product. They can be used for (un)loading cantilever racks, some toast racks, stands or long product stillages. The driver is protected by the cab during lifting and handling.



Photograph 56 Use of a side-loader lift truck for handling long, broad product

167 Modern stockholders may also use guided aisle specialist reach trucks to access storage systems holding a variety of products (eg sheet and long stock). The positioning of the cabs allows better overall visibility and the guided aisle systems generally suffer less damage to the storage systems.



Photograph 57 Guided aisle specialist reach truck for cantilever racking system

168 A range of specialised accessories are available for use with FLTs enabling them to be adapted for safe handling of a wide range of stock. An assessment should always be made to ensure that appropriate accessories are fitted. Operators should understand the limitations of their FLT and any accessories used with them, including de-rating the lifting capacity of the FLT as necessary. See examples of accessories in paragraphs 135, 138–139, 148 and 149.

169 FLT's and the similar pedestrian operated lift trucks should only be used for lifting purposes. They should not be used for other purposes eg pushing coils off an 'eye to sky' coil stack which can lead to serious crush injuries. Specifically designed lifting equipment with suitable accessories should always be used to lift or manoeuvre any product.

170 More information about operator training requirements and the safe operation of this equipment is found in *Rider-operated lift trucks: Operator training and safe use*.²²

Workplace transport

171 Every year there are accidents involving workplace transport some of which result in people being killed. People fall off vehicles, or are struck or crushed by them. Other incidents involve people being hit by falling objects (usually part of the load) or by vehicles overturning. Vehicles are particularly dangerous when they are reversing, because it can be difficult for drivers to see what is going on behind them.

172 The root causes of accidents are usually due to poor management control. Employers often fail to provide a **safe site, safe vehicles or safe driver** or fail to make sure that safe systems are followed (usually through too little information, instruction, training or supervision).

173 The employer must manage all three areas well for workplace transport risks to be controlled effectively. More information to help you make sensible decisions that will make your workplace safer can be found at HSE's workplace transport website²³ or in *A guide to workplace transport safety* (HSG136).²⁴

Safe site

174 Consider the following:

- Is the site organised so that pedestrians and vehicles are kept apart as far as possible?
- Are vehicle and pedestrian traffic routes clearly marked (including safe crossing points for pedestrians) and are signs clearly visible?
- Are there site rules and are they enforced?
- Is there an effective one way system (especially for heavy goods vehicles) so that reversing operations are kept to a minimum?

175 The site should have well-defined traffic routes that are free from obstructions, and road/ground surfaces that are firm and even. Wherever possible, access into storage areas should be on level ground.

Safe vehicle

176 Consider the following for each vehicle used:

- Is it right for the job?
- Is it maintained, inspected and repaired regularly?
- Can it be accessed safely to minimise the need for work at height (preventing falls)?
- Has it been fitted with any safety devices?

177 There should be an effective maintenance programme covering the important steering and braking systems, and vehicle lights. Check that reversing aids, visibility aids, roll-over protection systems and driver restraints have been fitted where appropriate.

Safe driver

178 Consider the following for each driver:

- Are they qualified and competent?
- Is their training up to date?
- Are they aware of their health and safety responsibilities?
- Do they have the correct PPE?

179 Driver behaviour should be monitored or supervised as considered appropriate. Drivers of fork lift trucks, HGVs or other workplace vehicles should be trained to the appropriate standards described in *A guide to workplace transport safety* in the section on *Safe driver* (paragraphs 239 to 253).

Deliveries – loading and unloading

180 Deliveries and collections are essential to any business, but can be some of the most dangerous transport activities that take place. A significant number of serious accidents in the workplace take place during deliveries, some of which result in fatal injuries. People can be hit by objects falling from vehicles, struck by lift trucks, or can fall from vehicles.

Deliveries and collections

181 Good communication, co-operation and planning are crucial for safe deliveries and collections because there are usually several people involved, often working for different employers and sometimes speaking different languages. Where possible, agree safety arrangements when the order is placed. These should be confirmed in writing, making it clear who has responsibility for what during loading and unloading. Include details of the load being transported.

182 It is important to remember that drivers are not the only people responsible for the safety of the vehicle and the load. The consignor (the person or company who places the load onto the vehicle) and those in control of sites must ensure the loading is carried out safely and that the load will remain in a safe and stable condition until it reaches its destination. Those who control sites where unloading takes place must also ensure unloading is carried out safely. Hauliers are responsible for ensuring the correct equipment and vehicles are used and their drivers are properly trained and monitored.

183 Drivers are often injured during deliveries and collections. Their employer must ensure they are given adequate safety information beforehand. Simple delivery safety checklists may help them decide whether there are sufficient precautions in place, and to establish criteria for when they can reasonably refuse to continue with a particular delivery or collection. Drivers (including agency staff) should be made aware that they are authorised to refuse or stop loading or unloading for safety reasons. This should be confirmed with the recipient when organising the delivery or collection.

184 When organising deliveries and collections, employers and site operators should also make sure that:

- drivers know what to expect when they arrive at a site, for example any restrictions on vehicle size or type, or when goods should be delivered or collected;
- there is a safe system of work for deliveries and collections;
- there is a safe place for drivers to wait during loading and unloading;
- suitable equipment is available to allow safe loading and unloading, for example for drivers delivering at retail outlets;
- there is enough time allowed for drivers to check loads are secure and sheeted properly;
- instructions (in writing) are provided for all those involved.

185 On large sites, consider scheduling collections and deliveries to avoid the start and end of shifts so that large numbers of pedestrians and passenger cars do not conflict with HGV traffic. Also, consider avoiding the times when buildings near your site may be busy, eg the start and end of a school day. For more information on deliveries and collections, see *Delivering safely*, on the HSE website.²⁵

Visiting drivers

186 Visiting drivers should report to the site operator for any relevant instructions such as the workplace layout, which route to follow, and where to park, load and unload. They may not have visited the site before and may not be fluent in English so consider, for example, providing a plan of the workplace at the entrance with clear and concise instructions in several languages, possibly including pictures.

187 It is important for site operators to co-operate with the employers of visiting drivers, to co-ordinate the measures needed to help them both meet their health and safety responsibilities.

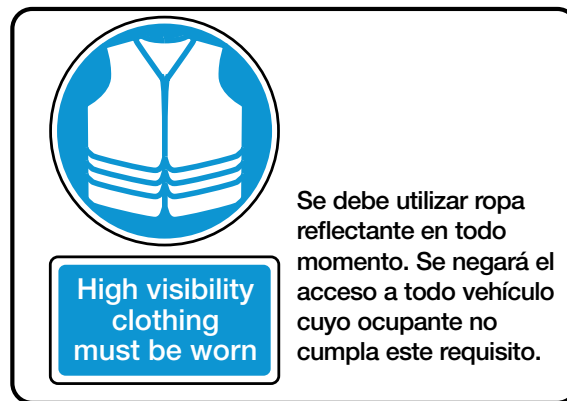


Figure 18 Example of a sign for visiting drivers

Loading and unloading areas

188 Loading and unloading areas should:

- be in designated places, clear of passing traffic, pedestrians and other people who are not involved in loading or unloading;
- be clear of overhead power cables or pipework so there is no chance of fouling them, or of electricity jumping to earth (arcing) through machinery, the load or people;
- be on firm, level ground, free from potholes and debris;
- have a safe area for drivers to wait that allows them to rest between driving shifts, especially if they may be waiting for several hours. Provide easy and safe access to toilet, washing and refreshment facilities and shelter in case of bad weather.

189 Although everyone involved in loading a vehicle is responsible for the vehicle being loaded safely, drivers need to make sure their vehicle has been properly loaded, because they drive on public roads. Where drivers need to observe the loading, this should be from a clearly marked, safe position, eg away from moving vehicles, or places where loads could fall.

Reversing

190 Many deaths and serious injuries involving vehicles at work happen during reversing, with poor visibility being the main cause. There are several measures that can help to reduce the risk of reversing accidents, but removing the need for reversing is the most effective.

191 Adopting a one-way system is one of the best ways to reduce reversing operations (see HSG136, paragraph 44 for more information). If a one-way system is not possible, consider:

- establishing drive-through loading and unloading zones, and parking areas with entrances and exits on either side;
- providing turning areas to allow vehicles to turn and drive forwards for most of the time, ideally a roundabout or 'banjo' type, although 'hammerhead' or 'stub' arrangements are also suitable.

192 If reversing cannot be avoided:

- establish and clearly mark dedicated reversing areas using longitudinal guides or white lines that are clearly signposted for both drivers and pedestrians;
- design or modify existing reversing areas, eg by making them larger, to improve visibility for both drivers and pedestrians;

- exclude non-essential personnel from areas where vehicles are reversing;
- fit fixed mirrors or other visibility aids in the workplace to improve visibility around vehicles;
- consider installing reversing aids on vehicles, such as CCTV and reversing sensors (see HSG136, paragraphs 224–228);
- use a trained banksman (signaller), but only when all other options have been exhausted. (see HSG136, paragraphs 94 to 97).

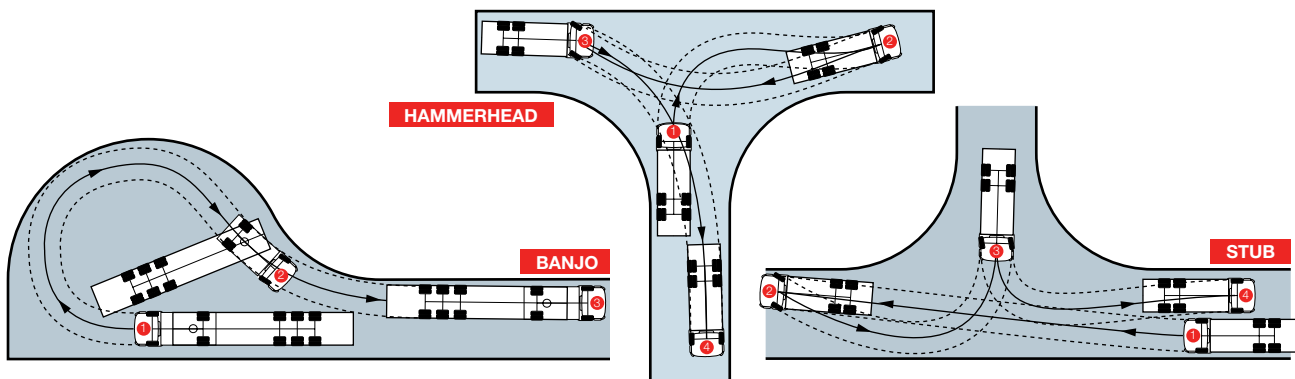


Figure 19 Banjo, hammerhead and stub arrangements

Unloading Issues

193 In stockholding premises the following unloading issues should be considered:

- Where will unloading take place and what hazards (including likely environment and effects of weather) are present?
- What, if any, vehicular access restrictions apply?
- Who will be responsible for unloading the vehicle, including duties of the driver?
- What is the condition of road and ground surfaces (including climatic effects, eg ice/rain).
- How will people not involved in unloading (which may include the driver) be kept out of danger areas?
- What are the requirements for manual handling of stock during the unloading/delivery process?
- What lifting operations are needed and is suitable lifting equipment available?
- Are there safe system(s) of work including supervision arrangements?
- Are any other special factors to consider (eg oiled stock may create additional slip hazards).

194 The driver should always be in a safe position when unloading is taking place. It should normally be the responsibility of those in control of the site for managing this activity. The provision of safe driver zones is now common within industry to ensure that everyone knows where delivery drivers are during delivery. The exception is where the lifting equipment being used is located/installed on the delivery vehicle and the driver would take responsibility for lifting operations.

Work at height on vehicles

195 Falls from vehicles are very common and account for around a third of all workplace transport injuries, many while loading and unloading. They are often caused by:

- slipping while walking on loads;
- tripping on ropes or torn sheets, causing overbalancing;
- wearing inappropriate footwear;
- poor working surfaces made worse by bad weather;

- poor means of access onto and off the vehicle;
- a lack of awareness and training.

196 Employers must take suitable and effective measures to prevent anyone from falling a distance that is likely to result in injury. This includes getting on and off a vehicle trailer or climbing into and out of a vehicle cab. Before working at height, work through these simple steps:

- Avoid work at height where you can.
- Use equipment to prevent falls where work at height cannot be avoided.
- Use equipment to minimise the distance and consequences of a fall where the risk cannot be eliminated.

197 Do as much as you can from the ground, for example by using hoist controls that are accessible from the ground.

198 If work at height cannot be avoided, collective control measures should always take priority over personal control measures. Collective measures protect everyone who is at risk (ie more than one person at any one time), for example gantries or platforms fitted with guard rails, and they usually require no action by the user to work effectively.

199 Personal control measures rely upon PPE and only protect the individual, for example a personal fall-protection system. They usually require the user to do something for them to work effectively, such as putting on a safety harness correctly and connecting it via an energy-absorbing lanyard onto a suitable anchor point.

Platforms and gantries

200 Most site-based platforms are simple drive-through or drive-past structures. They should be designed so that drivers are able to pull up closely alongside the platform to prevent falls between the vehicle and the edge of the platform. Most platforms are a fixed height and width, so cannot be adapted to accommodate vehicles of different sizes.

201 Gantries can be used where many different-sized vehicles are expected and normally consist of a platform with an overhead beam that extends over the vehicle. A personal fall-protection system is attached to the beam. They provide greater flexibility in terms of vehicle size, but rely on user training, and on monitoring to make sure they are used properly.

202 Platforms and gantries should have a safe way for people to get on and off them. Stairs are preferable to ladders on site-based platforms.

Personal fall-protection systems

203 These systems are likely to be either 'work restraint' (which will prevent a person approaching an area from which they can fall) or 'fall arrest' (which does not prevent falls, but minimises the consequences of a fall). Select suitable work-restraint systems ahead of fall-arrest systems.

204 Any decisions about using fall-protection systems should be made following a risk assessment and their use should be properly supervised and managed. Personal fall arrest systems should not be used where there is a risk of a fall over a sharp edge; any shock loading from a fall may cause the edge to cut the safety line. In such circumstances personal fall restraint systems should be used.

205 These typically have an anchor point, a lanyard and a harness, which should all be compatible with each other. The equipment should be inspected regularly (see the HSE leaflet *Inspecting fall-arrest equipment made from webbing or rope*).²⁶

206 You should train workers and instruct them in how to use the work equipment properly. They should have received appropriate practical and theory training from a competent person (the supplier of the system or in-house trainers who have been trained and assessed by the system supplier) before they use it.

207 Specific advice for steel stockholders on fall arrest systems is available in *Use of fall arrest systems in steel stockholders*. If you are using a fall-arrest system, you should have a rescue plan in place in case you need to quickly retrieve a worker who has fallen.

Industry guidance

208 The whole steel industry has recognised the high risks involved in the delivery process and has written its own guidance. The guidance identifies not only 'good practice' which should achieve compliance with health and safety law, but also details state of the art 'best practice' which achieves a higher standard of protection. This best practice is already being introduced in some of the steel mills and associated stockholding premises. The guidance, *Safe delivery and unloading of steel products*,²⁷ is jointly written by UK Steel and NASS.

Barring-off

209 Barring-off (using levers such as metal bars, to physically lever stock off a delivery vehicle) must not be undertaken under any circumstances as there is a high risk of serious injury to people on delivery vehicles and to others in the vicinity of the vehicle.

210 Barring-off has been carried out historically, but it is not a safe method of off-loading and has led to numerous serious and fatal accidents.

- Operators cannot fully control the procedure and are at risk of crushing, particularly when unexpected stock movement occurs on the vehicle.
- Fatal incidents have also occurred when operators lost balance and fell from the vehicle during the barring-off process.
- Other people are at risk of fatal injury by being crushed or struck by stock falling from the vehicle.
- Manual handling injuries were also common.



Figure 20 Unsafe system of work. Fall from lorry during barring-off of bundled stock

Load safety and security

211 The results of failings in load security happen largely on public roads, however some incidents do occur in stockholder premises when an occupier has to deal with loads which have moved during transportation. An estimated 1200 people a year are injured and damaged product costs businesses millions of pounds.

212 Where an incident occurs on public roads/footpaths, road traffic law will apply and these incidents will be investigated by the police often with the help of the Driver and Vehicle Standards Agency (DVSA).

213 Health and safety law will apply to employers, the self-employed and employees who undertake activities which involve the management of load security and the consequences of it (ie dealing with shifted loads) at a premises.

What can happen?

214 Loads can move in all directions if they are not properly secured. This can have catastrophic consequences where the load is not secured against the headboard. Unrestrained loads can increase the risk of vehicle rollover and load spillage and risk the life of the driver and other road users.



Photograph 58 Accident showing what can happen when a load is unsecured



Photograph 59 The result of an inadequately restrained coil combined with hard braking

Suitable vehicles for the load

215 The vehicle transporting the load should be able to take the full weight of everything it is required to carry, including any loading or unloading equipment, such as a lift truck.

216 No vehicle should ever be loaded beyond its rated capacity (the manufacturer should provide this information) or its legal limit of maximum permitted axle and gross weight limits if it is to be used on public roads. Overloaded vehicles can become unstable, difficult to steer, and have less efficient braking.

217 Where a part of the load is to be picked up or removed in the course of a journey, you must take into account the effect on gross weight, individual axle weights and on the securing and stability of the load. Although removal of part of the load will reduce the gross vehicle weight, the change in weight distribution may cause individual axles to become overloaded (often referred to as the diminishing load effect).

218 It is important to remember that the weight of the load itself will not be enough to prevent it moving – even heavy loads can move during transport. Friction alone cannot be relied on to keep the load in place.

Anchor points

219 When loads are secured to a vehicle, the places where the load straps are attached are known as anchor points. They should:

- be designed to distribute the forces they receive into the main chassis frame of the vehicle;
- move as little as possible if they have moving parts, to prevent lashings losing tension in transit;
- be compatible with the securing equipment to be used. Attachments should meet the relevant British Standards (for example, eyebolts to BS EN ISO 3266);²⁸
- be firmly attached either directly to the chassis or to a metal crosspiece or outrigger (those secured only to wooden members are unlikely to be strong enough).

Load-securing equipment

220 When using load-securing equipment, take account of the following:

- Avoid using sheeting hooks to secure loads as they are only designed to secure a tarpaulin over the load for weather protection.
- Lashings (such as webbing, chains, cables or clamps) should be in serviceable condition and be checked for damage at regular intervals to ensure their tension has not been lost. Use sleeves and/or corner protectors to prevent damage to both the load and the lashing or sheet if it passes over a sharp edge or corner.
- Ropes and buckle straps suspended from a roof rail and/or the curtains of a standard curtain-sided vehicle are generally not suitable for securing a load.

Curtain-sided vehicles

221 A curtain is a thin, flexible sheet, and even when it is reinforced it can usually only resist a moving load by bulging outwards, which can make the vehicle unstable when it is moving. Goods carried in curtain-sided vehicles not constructed to at least BS EN 12642²⁹ 'XL' standard or equivalent should therefore be secured as if they were being carried on an open flatbed vehicle.

222 XL trailers are reinforced trailers built to the BS EN 12642 XL standard and tested for body strength. They should come with a test certificate explaining the conditions for using them and there should be stickers on the trailer itself to verify its status.

Packing

223 Pack individual parts of a load closely together to prevent them moving, but if this is not possible, use suitable packing to fill any gaps, eg timber, folded cardboard, hardboard, high-density foam or air bags. This packing should take up as much of the empty space as possible.

Loading vehicles safely

224 Anyone responsible for loading should be given clear instructions and training on how to distribute loads safely on the vehicle so it is safe to drive. Follow these principles where possible:

- Spread loads as evenly as possible during loading, moving and unloading as unbalanced loads can make the vehicle or trailer unstable, or overload individual axles.
- Place the load as close as possible to the bulkhead or headboard. Fill any gap with appropriate packing material where this is not possible. However, avoid loading drawbar trailers too far forwards – this can lead to a snaking effect as the combination moves.

- Avoid loading to the back of the trailer, because this can cause the trailer to tip backwards (especially for single-axle trailers), reducing the vehicle's grip on the road surface.
- Arrange loads close to the middle of the trailer and slightly forward of it to place enough downward force on the tow bar to keep the trailer coupled, but not putting too much pressure on the tow vehicle suspension or hitch.
- Balance loads across the axle (or axles) of a drawbar trailer so that coupling or uncoupling can be managed easily and safely, and the trailer remains stable.
- Load in a way that will allow for efficient unloading (for example in reverse delivery order) and reduce double handling.

Multi-site deliveries

225 Delivering to more than one site is more complicated than delivering to just one site because:

- it increases the number of times people have to rearrange the load between deliveries;
- it increases the number of times tasks have to be performed, eg repeatedly sheeting and unsheeting a load;
- each site will have a different layout and different site rules.

226 Vehicles are often loaded in drop order. As this can have an impact on unloading after the first drop, consider:

- who will unload the vehicle at each drop;
- whether the load needs to be rearranged so the vehicle axles are not overloaded, and who will do this;
- how the diminishing load will be secured, and who will do this;
- the fall-prevention measures required for those who have to repeatedly climb onto to the load bed of a flatbed vehicle, often with no controls (like gantries) at the sites they visit. For more information on how to prevent falls, see paragraphs 203–207.

Shifted loads

227 Loads that have shifted during transport can fall from a vehicle. Every driver needs to know how to deal with a load that has moved into an unsafe position. If the load appears to have shifted:

- assess the safety, stability and security of the load before any restraints are removed;
- quarantine the vehicle in a safe area, away from other work, until a competent person has decided on a safe system of work for unloading (a competent person is someone with the necessary skills, knowledge and experience to do the work safely);
- do not open a bulging curtain on a curtain-sider as the load could fall out – access the load compartment using another route, such as the back door or the curtain on the other side of the vehicle;
- ask for help from the receiving employer or site operator if necessary.

228 The Department for Transport Code of Practice *Safety of loads on vehicles*³⁰ gives detailed advice about securing different types of loads to be transported on public roads. There are also two books produced by the Health and Safety Laboratory: *Transport safety – An Operator's Guide to Safe Loading and Transport*³¹ and *Load Safe, Road Safe – A Professional Driver's Guide to Safe Loading and Transport*.³²

229 HSE's load safety website also has some useful information.³³

Inspection and maintenance of equipment and systems

Why are inspection and maintenance important?

230 Lifting equipment and handling systems should be maintained in an efficient state and in good repair. Equipment can quickly be subject to significant wear and tear, even with the most careful use, and a comprehensive programme of periodic inspection and targeted, preventive maintenance is essential. Inspection and maintenance programmes should always be carried out by trained, competent personnel and should cover:

- inspection before first use;
- routine (ongoing) inspection and maintenance.

231 Equipment identified as having safety critical defects should immediately be taken out of service and either repaired before re-use, or replaced.

What should be inspected?

232 All work equipment should be inspected in accordance with an inspection programme based on the recommendations of equipment manufacturers/suppliers and, where relevant, the appointed 'competent persons' for any equipment which is also subject to statutory thorough examination and test. This would normally include:

- all lifting equipment and accessories (these also require periodic thorough examination by a competent person);
- storage equipment for lifting attachments;
- storage racking (eg for broken, missing or damaged components). See paragraphs 72–78;
- access equipment (mobile and fixed);
- working environment including floors, guard rails and barriers;
- other work equipment, eg saws and other processing machinery.

When should equipment be inspected/maintained?

233 Equipment should be thoroughly examined to ensure that it is safe for use before being taken into use for the first time, or after dismantling and reassembly. This examination (and testing where appropriate) should ensure that it has been correctly installed/commissioned and is fit for its intended use.

234 Regular inspection and maintenance is needed to ensure that work equipment continues to be safe to use. This should include periodic checks (eg weekly or monthly checks) in accordance with the manufacturer's instructions, as well as statutory thorough examinations. For example:

- Operators should check equipment for safety each day before they use it. They should carry out visual checks of lifting accessories, such as chains, slings and ropes, every time these are taken from the stores for use, and operators of fork-lift trucks should carry out a series of checks on their vehicles every shift.
- Weekly or monthly visual inspections should be carried out by a line manager or another appropriate person.
- Statutory thorough examinations (under LOLER) or inspections (under PUWER) should be carried out by competent persons.

Table 17 Mandatory and recommended inspection frequencies for different types of equipment

Item	Examination/inspection frequency
Lifting equipment, eg overhead cranes and mobiles cranes	Daily before-use check by operator and other inspections in accordance with manufacturer's recommendations Statutory thorough examination/test at least annually or in accordance with a written scheme of examination prepared by a competent person
Lifting accessories, eg: chains; slings; ropes; fork-lift chains; vacuum lifting attachments; magnetic lifting attachments (with exceptions)	Daily before-use check by operator and other checks in accordance with manufacturer's recommendations Statutory thorough examination at least six-monthly or in accordance with a written scheme of examination prepared by a competent person
Access equipment, eg mobile safety stairs	Recommended daily before-use check by operator and monthly visual inspections
Storage equipment for lifting accessories and other work equipment	Recommended monthly visual inspections or as recommended by the manufacturer or supplier

How should the checks/inspections and thorough examinations be recorded?

235 Records may be written or stored in electronic format (provided they are protected from interference and recoverable when needed). Statutory examination reports (eg under LOLER) must be kept for a minimum of two years but you may find it useful to keep records of all types of inspections for longer periods to identify longer term trends. These can be used within management tools for cost-effective targeting of maintenance and for assessment and control of risk. They can also be used to identify work planning and training needs and feed into areas where supervision may need further refinement.

Manual handling and injuries from sharp edges

236 Manual handling causes over a third of all workplace injuries. These include work-related musculoskeletal disorders (MSDs) such as pain and injuries to arms, legs or joints and repetitive strain injuries of various sorts. Manual handling covers a wide variety of activities including lifting, lowering, pushing, pulling and carrying. If any of these tasks are not carried out appropriately there is a risk of injury. In the metal stock industry, a high proportion of 'handling injuries' result from sharp edges commonly found on metal stock. These injuries are often easily prevented and measures should be implemented to reduce them.

Injuries from sharp edges

237 Articles with sharp edges can result in cuts, abrasions, infected wounds, dermatitis, amputations and fractures. Even minor incidents can result in the injured person being away from work or transferring to lighter duties. Problems can also occur with infections of uncovered cuts or contamination of cuts with chemicals (eg suds).

Hazards

238 Contact with sharp edges is routine in many jobs:

- where people are involved in handling sheet or strip metal;
- from accidental contact with scrap metal or banding, principally during cleaning and disposal;
- during processing work, where small pieces of metal with sharp edges are handled frequently;
- by contact with machinery blades, cutters or tools (eg when fitting, removing, cleaning or storing).

239 Those most at risk include:

- stores and warehouse staff;
- tool setters, maintenance workers;
- operators of machines such as presses, guillotines, and steel-slitting lines;
- welders who have to move or hold items being worked on.

240 Working practices of these employees should be examined carefully to determine the level of risk by considering:

- Where might there be sharp edges?
- How heavy are objects being handled and which parts of the body are most at risk? Is it just the hands or could the lower limbs also be affected?
- Does the handler have to walk up or down stairs, or through an awkward gap? Is the floor even? Are there obstructions or liquid that people might slip on?
- Is there potential for secondary contamination or infection, eg where sharp-edged items are being jigged in metal-finishing workshops?

Reducing the risks

241 Where risk of injury is identified, appropriate measures should be introduced. Try working through the list below. You should consider each possibility and decide whether it is reasonably practicable for you to take the steps outlined:

- Ask your supplier to remove or protect sharp edges on material being supplied, eg by machining out sharp edges or fitting plastic covers or padding.
- Engineer out sharp edges produced during your processes, eg tooling could be designed to minimise sharp edges, edges of metal strip could be dressed or rolled, edges of large items could be ground or sanded; or protect edges before handling.
- Avoid handling by using trays, jigs, holders, tongs, hooks, baskets, hoists, trolleys, lift trucks etc.
- Minimise handling by automating processes by using conveyor belts, feed and discharge chutes, automatic feeds and air ejection systems etc (although the latter may increase noise risks).
- Remove scrap with a rake or shovel, and swarf with a tool or brush.
- Store articles correctly so that they are retrieved easily.
- Use suitable PPE.

242 The necessary PPE identified by your risk assessment may include gloves, gauntlets and armbands. All PPE must be suitable for the circumstances, taking into account the range of employees who will use it, as well as the nature of the task, the load and the working environment.

243 PPE should be used as a last resort, or where there is still a residual risk despite the introduction of engineering controls. Remember that gloves can pose a serious entanglement risk at drilling machines and other machinery with rotating parts. These machines should be effectively guarded and gloves must not be worn where there is a risk of entanglement. Insides of gloves should be kept clean, free from swarf and substances which may cause cuts or irritation.

Training and supervision

244 Whatever control measures you decide on, your employees will need to be trained how to use them. Systems of work may be needed for cleaning and maintenance of machinery where this results in contact with swarf or sharp material.

245 The use of gloves and other control measures by employees should be enforced where a risk assessment indicates a need for them. All employees have legal responsibilities to co-operate with you and use the control measures provided, including PPE. Managers and supervisory staff should be active in encouraging and enforcing the use of PPE where appropriate.

Manual handling

246 Manual handling injuries can have serious implications for both the employer and the person who has been injured. They can occur almost anywhere in the workplace and heavy manual labour, awkward postures and previous or existing injury can increase the risk. To help prevent manual handling injuries in the workplace, you should avoid such tasks as far as possible. However, where it is not possible to avoid handling a load, employers must look at the risks of that task and put sensible control measures in place to prevent and avoid injury, using lifting aids where necessary.

247 More information about MSDs and manual handling, including the MAC tool, is available on HSE's MSD web pages³⁴ and in the leaflet *Manual handling at work: A brief guide*.³⁵

Why is manual handling of metal stock hazardous?

248 Because of the size, weight and shape of most metal stock, manual handling will often involve a significant risk of MSD. Transport, storage and handling systems should be planned, designed and installed to eliminate the need for high-risk manual handling operations wherever possible.

249 MSD from metal stock handling is most likely to be caused by:

- high levels of force (for example when pulling materials out of racks);
- difficult manual handling tasks;
- too much bending, stretching or physical effort;
- a poor working posture.

250 In addition, there may be a significant risk of crushing (primarily fingers, hands and feet), or other injury, caused by unexpected movement of material during manual handling.

What needs to be done?

251 *The Manual Handling Operations Regulations 1992 (as amended) (MHOR)*³⁶ require employers to avoid hazardous manual handling operations wherever possible. Through prior planning of stock delivery, handling and storage the employer should be able to identify where dangerous manual handling is carried on and where it can be subsequently avoided, eg by mechanisation. In most bulk stock situations mechanical lifting equipment is used, but where large packs need to be broken down or for order picking purposes, some manual handling may be involved. Where such manual operations cannot be avoided, employers should work with their employees to:

- assess the risk;
- determine ways of reducing the risk of injury so far as is reasonably practicable;
- Implement measures to reduce the risk;
- make sure that employees know the risk and how to control it;
- monitor the control measures to ensure they are effective and review the risk assessments when appropriate.

Assessing the risk

252 When carrying out risk assessments for manual handling, employers should consider examining their activities into the following general areas:

- Task
- Load
- Working environment
- Individual capability

253 The assessment should cover the full range of manual handling operations where there is risk of injury. This will include the majority of situations in which stock is handled. High risk activities include:

- the handling of particularly heavy stock;
- holding loads away from the body;
- long carrying distances;
- strenuous pushing or pulling;
- twisting, stooping, or reaching upwards;
- sudden movement of the load;
- the handling of unstable loads or those likely to shift;
- loads that are difficult/awkward to grasp;
- the handling of sharp edges;
- working in awkward environments (eg where there are space constraints, uneven or slippery floors, variations in floor levels, work outdoors or where lighting is poor).

How can the level of risk be reduced where manual handling is continued?

254 The employer needs to ensure that manual handling risks are controlled. Provide:

- suitable aids for the safe lifting/moving/storage of stock (eg lifting equipment, trucks and trolleys);
- safe systems of work;
- a safe working environment;
- adequate instruction, training and supervision.

255 Anyone required to carry out manual handling operations needs suitable training to enable them to recognise the hazards and minimise the risks. It should cover at least the following:

- How to recognise hazardous manual handling operations and avoid them.
- How to deal with unfamiliar manual handling operations.
- How to use handling and lifting aids safely.
- Information about possible musculoskeletal injuries – what they are and how they affect the individual.
- Information about early reporting of symptoms of musculoskeletal injuries.
- Effects of personal protective equipment on manual handling operations.
- Knowing and understanding their own capabilities and limitations – the effects of age, size, fitness, health and pregnancy.
- Safer manual handling techniques.
- The effects of the working environment (eg heat, cold, flooring contamination) and the importance of good housekeeping.

Glossary

Aisle

Space giving access to picking or loading faces of racking systems or storage areas.

Banding

Metal strapping or wire put around stock to form bundles or hold coils in shape, and around stock on pallets/timbers to secure it to the pallet. Plastic and fabric strapping is sometimes used as an alternative.

Barriers (or stops)

Substantial fixed structures capable of retaining stock and preventing movement and offering some degree of protection in case of emergency (eg concrete blocks fixed into the floor preventing a stack of coils from rolling).

Barring-off

Historical term for the use of levers (eg metal bars) to physically lever product off a delivery vehicle.

Battens

Hardwood, metal or plastic spacing pieces for separating or supporting stock; usually placed horizontally between bundles or individual plates or sections to enable stable storage and access for attaching lifting accessories. Only similar-sized battens should be used together.

Bearer

See 'Battens'.

Bundling

See banding.

Chocks

Pieces of hardwood or plastic, usually wedge-shaped, used to prevent unexpected movement, eg rolling of individual coils. The longest edge should always be in contact with the floor/storage system.

Consignment

The point at which delivered goods become the customer's responsibility. It is the end point of delivery and is likely to be the same point at which financial liability for damage or loss transfers from supplier to customer.

Delivery

Delivery covers the period from arrival at the delivery address to the pre-agreed point at which the stock becomes the customer's responsibility. It may or may not include unloading of the vehicle.

Drops

The number of individual deliveries a vehicle will make to fully discharge its load.

Dunnage

Packing supports used to separate/secure stock on the back of a vehicle while in transit. This can be made of wood, plastic, steel bars or hollow steel sections. Use of dunnage provides access for easier/safer attachment of lifting accessories and helps to prevent load movement. Also used as an alternative term for batten or bearer.

Exclusion zone

A clearly defined area around a vehicle being loaded or unloaded from which all pedestrians and unauthorised persons are excluded while (un)loading is taking place.

Fixed supports/uprights

Vertical members designed to retain stock, usually sheet and plate, in the vertical plane.

Frame

Two or more uprights joined by bracing members.

Gangway

Space for movement or transport between racking or storage areas but which does not give direct access to picking or loading faces.

Pallet

A portable platform (with or without superstructure) used for the storage and transit of stock.

Plate

Flat, rectangular stock – usually 25–300 mm thick.

Racking

A skeleton framework of supports, of fixed or adjustable design, to support loads without the use of shelves.

Safe working load (SWL)

A load limit assigned by the manufacturer and/or the competent person for the proposed use of the equipment taking into account the weight of associated lifting accessories and other loading on the equipment (eg wind loading or fixings between surfaces).

Sheet

Flat processed steel made from broad coil (usually up to 25 mm thick).

Stillage

Two parallel horizontal supports fitted with cross members and vertical supports, for storing long product or bore-horizontal coil.

Stock

Steel or other metal in its raw material form used for manufacture of metal products. In this guidance, it refers to the common forms of steel stock: long product, coil and sheet. It does not include wire or other specialised metal products.

Stops

See 'Barriers'.

Strapping

Plastic or fabric strip used as an alternative to metal banding.

Working load limit (WLL)

This term has the same meaning as 'Safe working load (SWL)' but is more commonly used across Europe.

Appendix 1 Typical racking inspection report

NOTE: - Do not use any racking considered unsafe for use; in such cases fence it off and mark up as 'Not Safe for Use'
- Report any faults, immediately after inspection, to the General Manager

Inspection checks to be carried out weekly - it is the responsibility of the General Manager to ensure that the racking is safe and that weekly inspections are carried out

Racking details			Floor condition (damaged/ uneven ect)	Guide rails/ protection barriers in place	Safe Working Load (SWL) clearly marked	Racking is within its SWL	Stock is safely stacked	Racking/ stock free of accident related damage	Racking free of broken, damaged or cracked components	Other comments
Location	Type of racking ie Ladder, Toast etc	Products stored	SWL of racking							
The above racking was found IN ORDER with the following exceptions: (Where necessary list additional observations on another sheet)										
Competent person carrying out the in-specification				Print name:	Sign:		Date:			

To be completed and signed off by General Manager

Follow-up action required:	
Signed: (General Manager)	Date follow-up action completed:

References

- 1 The Health and Safety Toolbox: www.hse.gov.uk/toolbox/
- 2 HSE's Risk management website: www.hse.gov.uk/risk
- 3 *Consulting employees on health and safety: A brief guide to the law* Leaflet INDG232 HSE 2013 www.hse.gov.uk/pubns/indg232.htm.
- 4 HSE's pages on Consulting and involving your workers: www.hse.gov.uk/involvement/
- 5 *Health and safety training: A brief guide* Leaflet INDG345 HSE 2012 www.hse.gov.uk/pubns/indg345.htm
- 6 *Using Work Equipment Safely* Leaflet INDG229 HSE 2012 www.hse.gov.uk/pubns/indg229.htm
- 7 HSE information about migrant workers: www.hse.gov.uk/migrantworkers/employer.htm
- 8 *Health and safety made simple: The basics for your business* Leaflet INDG449 HSE 2014 www.hse.gov.uk/pubns/indg449.htm
- 9 HSE's Temperature website: www.hse.gov.uk/temperature/
- 10 HSE's work equipment and machinery website: www.hse.gov.uk/work-equipment-machinery/
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- 12 *Use of fall arrest systems in steel stockholders* Sector Information Minute (SIM) 03/2007/15 HSE www.hse.gov.uk/foi/internalops/sims/manuf/3_07_15.htm.
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- 15 SEMA's website: www.sema.org.uk/
- 16 *Safe use of work equipment: Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance* L22 (Fourth edition) HSE 2014 www.hse.gov.uk/pubns/books/l22.htm
- 17 *Safe use of lifting equipment: Lifting Operations and Lifting Equipment Regulations 1998. Approved Code of Practice and guidance* L113 (Second edition) HSE 2014 www.hse.gov.uk/pubns/books/l113.htm
- 18 HSE's Planning and organising lifting operations web pages: www.hse.gov.uk/work-equipment-machinery/planning-organising-lifting-operations.htm
- 19 *Guidance on the safe use of magnetic lifting devices* HSE www.hse.gov.uk/work-equipment-machinery/resources.htm

20 HSE's Vacuum Lifting web pages:

www.hse.gov.uk/work-equipment-machinery/vacuum-lifting-equipment.htm

21 HSE's Lift trucks website:

www.hse.gov.uk/workplacetransport/lift-trucks/index.htm

22 *Rider-operated lift trucks: Operator training and safe use. Approved Code of Practice and guidance* HSE 2013 www.hse.gov.uk/pubns/books/l1117.htm

23 HSE's Vehicles at work website: www.hse.gov.uk/workplacetransport/

24 *A guide to workplace transport safety* HSG136 (Third edition) HSE 2014
www.hse.gov.uk/pubns/books/hsg136.htm

25 HSE webpages on delivering safely

www.hse.gov.uk/workplacetransport/information/cooperation.htm

26 *Inspecting fall-arrest equipment made from webbing or rope* Leaflet INDG367
HSE 2002 www.hse.gov.uk/pubns/indg367.htm

27 *Safe delivery and unloading of steel products* NASS/UK Steel 2014
www.nass.org.uk/Health-and-safety/Guidance/

28 BS EN ISO 3266 *Forged steel eyebolts grade 4 for general lifting purposes*
British Standards 2015 <http://shop.bsigroup.com/>

29 BS EN 12642 *Securing of cargo on road vehicles. Body structure of commercial vehicles. Minimum requirements* British Standards 2006 <http://shop.bsigroup.com/>

30 *Safety of loads on vehicles: Code of Practice (Third edition)*
The Stationery Office 2002 www.tsoshop.co.uk/

31 *Transport safety – An Operator's Guide to Safe Loading and Transport* Health and Safety Laboratory 2012 www.hsl.gov.uk/hsl-shop/transport-publications

32 *Load Safe, Road Safe – A Professional Driver's Guide to Safe Loading and Transport* Health and Safety Laboratory 2012
www.hsl.gov.uk/hsl-shop/transport-publications

33 HSE's load safety website: www.hse.gov.uk/workplacetransport/loadsafty

34 HSE's website on musculoskeletal disorders: www.hse.gov.uk/msd/

35 *Manual handling at work A brief guide* Leaflet INDG143(rev3) HSE 2012
www.hse.gov.uk/pubns/indg143.htm

36 *The Manual Handling Operations Regulations 1992 (as amended) (MHOR)*
www.hse.gov.uk/msd/backpain/employers/mhor.htm

Further reading

Other HSE material

Leading Health and Safety at Work: Leadership Actions for Directors and Board Members Leaflet INDG417 (rev1) HSE 2013 www.hse.gov.uk/pubns/indg417.htm

Pallet safety Plant and Machinery Guidance Note PM15 (Fourth edition) HSE 2014 www.hse.gov.uk/pubns/pm15.htm

Buying new machinery: A short guide to the law and your responsibilities when buying new machinery for use at work Leaflet INDG271 HSE 2011 www.hse.gov.uk/pubns/indg271.htm

Health and safety in engineering workshops HSG129 HSE 1999 www.hse.gov.uk/pubns/books/hsg129.htm

Manual handling. Manual Handling Operations Regulations 1992 (as amended). Guidance on Regulations L23 (Third Edition) HSE 2004 www.hse.gov.uk/pubns/books/l23.htm

Reporting accidents and incidents at work: A brief guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR) Leaflet INDG453(rev1) HSE 2013 www.hse.gov.uk/pubns/indg453.htm

Non HSE Material

BS 7121 *Code of practice for safe use of cranes* British Standards <http://shop.bsigroup.com/>

BS 5744:1979 *Code of practice for safe use of cranes (overhead/underhung travelling and goliath cranes, high pedestal and portal jib dockside cranes, manually-operated and light cranes, container handling cranes and rail-mounted low carriage cranes)* British Standards 1979 <http://shop.bsigroup.com/>

EN 15635 *Steel Static storage systems: Application and maintenance of storage equipment* British Standards 2008 <http://shop.bsigroup.com/>

Lifting Equipment – A User’s Pocket Guide Revised Edition 2014 Lifting Equipment Engineers Association 2014 <http://leeaint.com/uk/Lifting-Equipment---A-Users-Pocket-Guide-Revised-Edition-2014>

Moving steel by crane Video (available from National Association of Steel Service Centres (NASS), 1st Floor, The Citadel, Corporation Street, Birmingham B4 6QD (Tel: 0121 200 2288)) or available at www.nass.org.uk

Code of practice for the design and use of cantilever racking systems Storage Equipment Manufacturers Association (SEMA) www.sema.org.uk/guides.asp

Guide to the conduct of pallet racking and shelving surveys Storage Equipment Manufacturers Association (SEMA) www.sema.org.uk/guides.asp