



Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**

CODE OF PRACTICE

Prevention of falls from height at workplaces





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Foreword

This code of practice is issued by the Commission for Occupational Safety and Health under provisions of the *Occupational Safety and Health Act 1984* (the OSH Act). The introduction of the OSH Act enabled the establishment of the Commission. It comprises representatives of employers, unions and government, as well as experts, and has the function of developing the occupational safety and health legislation and supporting guidance material, and making recommendations to the Minister for Mines and Petroleum; Commerce and Industrial Relations for their implementation. To fulfil its functions, the Commission is empowered to establish advisory committees, hold public inquiries and publish and disseminate information.

The Commission's objective is to promote comprehensive and practical preventive strategies that improve the working environment of Western Australians. This code of practice has been developed through a tripartite consultative process and the views of employers and unions, along with those of government and experts, have been considered.

Legislative framework for occupational safety and health

Occupational Safety and Health Act 1984

The OSH Act provides for the promotion, co-ordination, administration and enforcement of occupational safety and health in Western Australia. It applies to all workplaces with the exception of mining and petroleum.

With the objective of preventing occupational injuries and diseases, the OSH Act places certain duties on employers, employees, self-employed people, manufacturers, designers, importers and suppliers. These broad duties are supported by further legislation, commonly referred to as regulations, together with non statutory codes of practice and guidance notes.

https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_a555.html

Occupational Safety and Health Regulations 1996

The Occupational Safety and Health Regulations 1996 (the OSH Regulations) set out specific requirements of the legislation. They prescribe minimum standards and have a general application, or define specific requirements related to a particular hazard or type of work. They may allow licensing or granting of approvals and certificates.

If there is a regulation about a risk in the OSH Regulations, it must be complied with.

https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_s4665.html

Codes of practice published under the OSH Act

Codes of practice published under the OSH Act provide practical guidance on how to comply with a general duty or specific duties under the legislation. Codes of practice may contain explanatory information. However, the preventive strategies outlined do not represent the only acceptable means of achieving a certain standard.

A code of practice does not have the same legal force as a regulation and is not sufficient reason, of itself, for prosecution under the legislation, but it may be used by courts as a standard when assessing other methods or practices used.

If there is a code of practice about a risk, either:

- do what the code of practice says, or
- adopt and follow another way that gives the same level of protection against the risk.

If there is no regulation or code of practice about a risk, choose an appropriate way and take reasonable precautions and exercise proper diligence to ensure obligations are met.

Note: There may be additional risks at the workplace not specifically addressed in this code of practice. The OSH Act requires identification and assessment of them and implementation of control measures to prevent or minimise risk.

Scope

This code of practice applies to all workplaces in Western Australia covered by the *Occupational Safety and Health Act 1984*. It provides detailed guidance on the prevention of falls from height at workplaces. However, it is not possible to deal with every situation that may be found at workplaces, where there is the potential for a person to fall from, through or into any place or thing.

See Appendix 1 for standards and other documents that supplement the information provided in this code.

Who should use this code of practice?

This code should be used by everyone who has a duty to prevent, as far as practicable, falls from height at workplaces. This includes employers, employees, self-employed people, architects, engineers, designers, builders, manufacturers, suppliers, safety and health representatives and safety and health committees. The practical guidance in this code of practice should be considered in conjunction with the general duties in the *Occupational Safety and Health Act 1984*.

Definitions

For the purpose of this code of practice:

AS and **AS/NZS** refer to Australian Standards and Australian/New Zealand Standards developed and published by Standards Australia. These are voluntary technical and commercial standards, which are sometimes referenced in the Occupational Safety and Health Regulations 1996. See Appendix 1 for more information.

Competent person means a person who has acquired, through training, qualification or experience or a combination of those things, the knowledge and skills required to do that thing competently.

Duty of the employer, where an employer has a duty under a provision of this code of practice to do something, but the employer is not the person in charge of the workplace at which an employee works, the employer has the same duty under that provision as the person in charge of the workplace has, except that the employer's duty is limited to an employee.

Falling includes reference to a person falling from, through or into a place or thing.

Person in charge of a workplace means the person who has the management or control of the workplace.

The Act refers to the *Occupational Safety and Health Act 1984*.

The Regulations refers to the Occupational Safety and Health Regulations 1996 and regulation refers to individual regulations in the Regulations.

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1 General duties at the workplace

The *Occupational Safety and Health Act 1984* (the Act) contains general duties which describe the responsibilities of people who affect safety and health at work [Section 19 of the Act]. These duties apply to the prevention of falls. The Act and the Occupational Safety and Health Regulations 1996 (the Regulations) should be read in conjunction with this code of practice.

Employers must, so far as is practicable:

- provide a workplace and safe system of work so employees are not exposed to hazards
- provide employees with information, instruction, training and supervision to enable them to work in a safe manner
- consult and cooperate with safety and health representatives (if any) and other employees in matters related to safety and health at work
- provide adequate protective clothing and equipment where hazards cannot be eliminated
- ensure plant can be used, cleaned, maintained, transported and disposed of safely.

Safe systems of work: workplace policies and procedures

Policies and procedures should be developed and implemented for each workplace to ensure safe systems of work and include:

- hazard identification and risk assessment and control processes
- monitoring performance and reviewing control measures
- mechanisms for consulting with employees
- induction and training programs
- an agreed system for reporting and recording information on identified hazards or other relevant safety and health information
- safe work methods (such as job or task procedures)
- ongoing inspection and maintenance programs
- emergency rescue procedures
- review of safety management policies and procedures.

Other people at the workplace

The Act also sets out duties for other parties at the workplace:

Employees must take reasonable care to ensure their own safety and health at work, and the safety and health of others affected by their work [Section 20 of the Act].

Self-employed people must take reasonable care to ensure their own safety and health at work and, as far as practicable, ensure their work does not affect the safety and health of others [Section 21 of the Act].

Employment or engagement of contractors and their employees

The person (called the principal in the Act) must ensure the safety and health of anyone they engage (called the contractor in the Act) to do the work. The principal is considered to be the employer of a contractor and any people employed or engaged by the contractor to carry out the work. Thus the principal has an employer's 'duty of care' to contractors and their employees for matters over which the principal has control [Section 23D of the Act].

Designers, manufacturers, importers and suppliers of plant must ensure that plant intended for use in a workplace is safe to install, maintain and use at workplaces. Safety and health information must be provided when plant and substances are supplied for use at work, and whenever requested for substances.

Designers and builders of a building or structure for use at a workplace must ensure, so far as is practicable, that persons constructing, maintaining, repairing, servicing or using the building or structure are not exposed to hazards [Section 23 of the Act].

Further information

The Commission's guidance note *General Duty of Care in Western Australian Workplaces* has more information on the duty of care requirements. It is available at www.commerce.wa.gov.au/sites/default/files/atoms/files/general_duty_of_care.pdf

Consultation

Consultation and co-operation between employers and employees are the keys to providing and maintaining a safe and healthy workplace.

Employers are required to consult with safety and health representatives (if any) and employees on safety and health matters [Section 19(1)(c) of the Act].

Employer and employee involvement in the process of identifying hazards from falls and assessing and controlling the risks will help to ensure that:

- the risks from falls are identified because employees are most likely to know about risks associated with their work
- employees have a commitment to this process and any changes, such as control measures, that are implemented
- fall incidents are eliminated or minimised.

2 Hazard identification, risk assessment and risk control – the risk management process for the prevention of falls

2.1 An overview

Employers have a duty to ensure, as far as practicable, that employees are not exposed to hazards at the workplace [regulation 3.1]. They can do this by following a risk management process to identify hazards and assess and control risks.

In addition, there is a specific requirement for employers to carry out this risk management process for the prevention of falls [regulation 3.49]. This involves a three step process to:

- identify hazards
- assess risks
- control risks.

To assist in identifying hazards where a person may fall and assessing and controlling the risks, consideration should be given to:

- previous injuries, 'near miss' incidents or accidents arising from falls which have occurred at the workplace or other similar workplaces
- relevant codes of practice and guidance notes
- consultation with employees, safety and health representatives (if any), safety and health committees, self employed people and contractors to find out what problems may be associated with performing tasks/ jobs
- walk through inspections of the workplace (consider using checklists)
- any other records or statistics which indicate potentially unsafe work practices.

2.2 Identifying hazards

Identifying hazards involves recognising things that may cause injury or harm to the health of a person, such as where a person may fall from, through or into a place or thing.

There are a number of ways to identify potential things or situations that may cause a fall to occur. Choosing an appropriate process or procedure for identifying hazards will depend on the nature of the work environment and hazards involved.

A hazard identification process or procedure may range from a simple checklist for specific equipment, such as a ladder or fall arrest system inspection checklist, to a

more open-ended appraisal of a group of related work processes. Generally, a combination of methods will provide the most effective results.

Hazard identification tools commonly used are the Job safety analysis (JSA) and Safe work method statement (SWMS). See Appendix 2 for an example of a completed JSA form.

You should check your records of previous injuries and 'near miss' incidents related to falls. Information and advice about fall hazards and risks relevant to particular industries and work activities is also available from regulators, industry associations, unions, technical specialists and safety consultants.

Common fall hazards checklist

Key things to check at the workplace include:

- **surfaces**
 - stability
 - fragility or brittleness
 - slipperiness (e.g. where surfaces are wet, polished, glazed or oily in the case of new steelwork)
 - safe movement of employees where surfaces change
 - strength or capability to support loads
 - slope of work surfaces (e.g. where they exceed seven degrees)
- **levels** (where levels change and employees may be exposed to a fall from one level to another)
- **structures** (the stability of temporary or permanent structures)
- **the ground** (the evenness and stability of ground for safe support of scaffolding or working platform)
- **the raised working area** (whether it is crowded or cluttered)
- **scaffolding** (the correct erection and dismantling)
- **edges** (edge protection for open edges of floors, working platforms, walkways, walls or roofs)

- **hand grip** (places where hand grip may be lost)
- **openings or holes** which will require identification or protection or unguarded shafts or excavations
- **proximity of employees to unsafe areas**
 - where loads are placed on elevated working areas
 - when objects are below a work area, such as reo bars and star pickets
 - where work is to be carried out above workers (e.g. potential hazards from falling objects)
 - power lines near working areas
 - when workers are establishing edge protection or fall restraint systems
- **movement of plant or equipment** (ensuring there is no sudden acceleration or deceleration)
- **access to, egress from and movement around the working area** (checking for obstructions)
- **structural integrity** (may be compromised by chemicals, welding, weather)
- **manual handling** (checking safe work practices for carrying awkward materials, such as plaster boards and roof sheeting, which may be caught by the wind)
- **lighting**
- **weather conditions** (when heavy rain, dew or wind are present)
- **footwear and clothing** (suitability for conditions)
- **ladders** (where and how they are being used)
- **young, new or inexperienced employees** (i.e. employees unfamiliar with a task)

2.3 Assessing and analysing risks

Risk, in relation to any injury and harm, means the probability of that injury or harm occurring. This involves looking at the chance or likelihood of a fall occurring and, if a fall did occur, the extent of any harm or injury (i.e. the consequences). This is a way of deciding which hazards need to be tackled first (i.e. where there is the highest risk of falls).

This step should provide information on:

- where, which and how many employees are likely to be at risk of incurring injuries
- how often this is likely to occur
- the potential severity of any injuries.

You must consult your workers and their health and safety representatives at every step of the risk management process. By drawing on their experience, knowledge and ideas, you are more likely to identify fall

hazards and develop effective control measures. Risk assessment is not an absolute science – it is a ‘best estimate’ on the basis of the information available. It is therefore important that:

- the risk assessment is conducted by people with information, knowledge and experience in the process
- workers participate in the development of the risk assessment
- once completed, the risk assessment is communicated to the work group performing the task to ensure they understand the job steps, hazards and controls, and agree to the controls.

[Section 3 of the Act and regulation 3.143(5)]

In carrying out a risk assessment, it is necessary to break down each activity or process into a series of parts or smaller tasks and assess each one separately. A Job Safety Analysis can assist with this [See Appendix 2 Job Safety Analysis].

Information for risk assessments

Ways to determine the likelihood and potential consequences of each hazard include:

- looking at similar workplaces or processes
- looking at the workplace’s previous incident and injury reports and data for falls
- consulting with safety and health representatives (if any) and other employees
- looking at the way tasks/jobs are performed
- looking at the way work is organised
- determining the size and layout of the workplace
- assessing the number and movement of all people at the workplace
- determining the type of operation to be performed
- identifying the type of machinery/plant to be used
- assessing adequacy of inspection and maintenance processes
- examining the way all materials and substances are stored and handled
- assessing what knowledge and training is needed to perform tasks safely and the adequacy of current knowledge and training (e.g. gap analysis)
- examining adequacy of procedures for all potential emergency situations (e.g. accidents and rescues).

2.4 Controlling risks

The next step is to implement control measures to eliminate or reduce the risk of a person being injured or harmed (e.g. eliminate or reduce the likelihood of a person falling) and to ensure those measures are monitored and reviewed on an ongoing basis.

There is a preferred order of control measures, ranging from the most effective to the least effective in eliminating or reducing the risk of falls. This is outlined in Table 1.

The preferred way of controlling risk is by design, substitution, redesign, separation or administration. These control measures generally eliminate, reduce or minimise risk more effectively than personal protective equipment.

Specific regulations set out certain mandatory methods that are required to control the risk and some of these, such as the protection of holes and openings, are outlined later in this document.

Examples of control measures include:

- designing, planning and modifying plant, buildings and structures to prevent falls, including job planning to ensure, where practical, the need to work at heights is designed out or mitigated (e.g. building edge protection onto structures at ground level, then install them in place)
- looking at the way jobs can be done safely to eliminate or reduce the likelihood of a fall (e.g. checking that ladders are safe and used correctly)
- minimising the potential for dropped objects and establishing exclusion/drop zones
- organising and sequencing work so that people do not interfere with or increase the risk of a fall for themselves or others
- identifying, collecting and presenting information and knowledge required by employees and contractors to enable them to work safely
- identifying the training required to work safely if there is the risk of a fall
- identifying areas requiring non-slip surfaces for stairs or ladders.

See Section 5 Design and planning of plant, buildings and structures and Section 9 Ladders.

Table 1 Preferred order of control measures to eliminate or reduce the risk of falls

<ol style="list-style-type: none"> 1. Elimination – removing the hazard or hazardous work practice from the workplace (e.g. eliminating the need to access the fall risk area such as by installing air conditioning units in the centre of the roof). 2. Substitution – substituting or replacing a hazard or hazardous work practice with a less hazardous one (e.g. providing an alternative means of access such as a safe walkway so the risks of falls are avoided; or installing an elevating work platform for work at heights). 3. Isolation – isolating or separating the hazard or hazardous work practice from people involved in the work or people in the general work areas (e.g. barricading or enclosing the fall risk area with edge protection, installing handrails and covering floor penetrations). 4. Engineering control – if the hazard cannot be eliminated, substituted or isolated, an engineering control is the next preferred measure. This includes the use of a fall injury prevention system designed to restrain or arrest a person's fall from one level to another and minimise the risk of injury or harm to a person if they fall (e.g. a restraint system or fall arrest system, catch platforms, safety nets and safety mesh). It may also include modifications to plant or providing guarding to machinery and equipment. 5. Administrative control – this includes introducing work practices that reduce the risk, such as implementing measures to ensure that procedures, instruction, training and warning signs are in place to warn and protect persons exposed to falls. This could also include limiting the amount of time a person is exposed to a particular hazard. These controls should be used in conjunction with physical controls and appropriate supervision. 	<p>Most effective control measure</p>  <p>Least effective control measure</p>
<p>In some instances, a combination of control measures may be appropriate.</p>	

Other means of reducing the risk

Other means of reducing risks may be more appropriate to a particular case than the ones mentioned in this section, if they can eliminate or reduce the risk of a fall.

For example, the erection of different communication towers and masts (many of which may require multi guy lines) and advertising and other types of signage on towers and structures will require consideration of other means of reducing the risks of falling.

The risks associated with maintenance and servicing plant and buildings must also be considered.

In all cases, the three basic steps of hazard identification, risk assessment and risk control must be carried out.

2.5 Monitoring and review of control measures

Deciding on and implementing a risk control measure is not the end of the risk management process. It is important to constantly monitor and review control measures to ensure that they continue to prevent or control exposure to hazards or hazardous work practices.

A risk management process should be conducted as an ongoing process because workplaces are usually constantly changing environments with new hazards being introduced; for example, when new equipment or plant are introduced or the work environment or standards are changed.

In determining the frequency of the monitoring and review processes, consider such things as:

- the level of risk (high-risk hazards need more frequent assessments)
- the type of work practice or plant involved (there may be particular stages in the life of a piece of equipment where more frequent assessments are appropriate).

Each workplace should:

- have a planned program of inspections and maintenance
- undertake a review each time the work environment changes
- regularly review the process for hazard identification, risk assessment and risk control to ensure it is effective.

Maintenance of plant, equipment and structures

Maintenance and repair programs should be reviewed regularly to ensure their effectiveness. Performance testing and evaluation standards should be established.

Incorporating the manufacturer's recommendations, repair and maintenance programs should specify:

- where servicing is required
- the extent of servicing required
- the nature of the servicing required
- the frequency of servicing
- who is responsible for maintaining repair and maintenance programs
- how defects will be corrected.

In order to keep accurate maintenance records, a recording or reporting system should be developed, implemented and maintained.

3 Instruction and training

Employers must provide proper safety and health instruction and training to employees [Section 19(1)(b) of the Act].

Instruction and training are an important part of ensuring safe systems of work and should take into account the functions of each employee and provide them with the necessary skills and knowledge to enable them to do their work safely.

In providing training, it is also essential to address the intent of the Act and Regulations so that employees understand that, in some instances, the prevention of falls depends on them doing a particular work activity in a particular way, such as when using ladders and fall injury prevention systems and working on fragile and brittle roofs.

For examples of regulations for specific work activities, see regulation 3.26 (ladders), regulation 3.55 (edges) and regulation 3.57 (fragile and brittle roofs).

The type of instruction and training given should include:

- general safety and health induction, including the 'duty of care' responsibilities under the Act and Regulations and workplace policies and procedures
- task specific induction
- 'on the job' training
- 'in house' training programs designed to address specific needs, such as specific training for working from heights and correct use of ladders
- industry-based or formal training, such as accredited or certificated courses.

Training programs

In developing and implementing an effective training program, employers should include:

- analysis of training needs, including the identification of the tasks to be performed and associated hazards and risks
- identification of any pre-requisites or entry standards
- definition of learning objectives and clear identification of the extent/level of competencies to be achieved, such as what will be covered
- selection of appropriate training aids depending on the environment and the targeted trainees (use of hardware, graphics, videos and printed materials)
- adequate assessment (e.g. the assessment includes a practical component where the trainee has to demonstrate applied skills)
- recognition of skills attained where applicable (e.g. accreditation or certification)
- delivery of training by a competent person
- evaluation of effectiveness of training.

Induction

Induction programs are essential:

- for new employees
- where work situations have changed
- where work practices are being introduced for the first time.

In addition to providing general safety and health information, an induction should include:

- 'on the job' training, including how to carry out a job or task in a safe manner and not be exposed to falls
- information on the hazards and risks from falls at that workplace
- information on the selection, fitting, use, care, maintenance and storage of personal protective clothing and equipment, such as fall injury prevention equipment
- emergency rescue procedures.

Further training or re-training

Employees may need further training where:

- new methods, equipment, hazards, policies or procedures are introduced
- the type of operation or environment changes
- their particular job requirements change.

Certification or accreditation

There may be occasions when a person is required to obtain a licence to perform high risk work, or other formal certification or accreditation (e.g. certificates of competency are required under the safety and health legislation for scaffolders, riggers and doggers).

Where a particular type of accreditation or certification is required before a job or task can be carried out, employers must ensure that such accreditation or certification is valid and current.

Employers must also ensure that people who are being trained to obtain accreditation or certification are supervised during the training.

The possession of a certificate of competency does not provide any exemption from the requirement for fall protection to be provided for a person working at heights.

Prevention of falls training

Training in the prevention of falls should include:

- safe work systems and practices to prevent falls, including how the systems installed prevent falls
- hazard and incident/accident reporting systems
- the correct selection, fitting, use, care, maintenance and storage of personal protective equipment (see the following page for fall injury prevention systems)
- correct selection, use, care and storage of tools and equipment to be used (e.g. using a tool belt instead of carrying tools)
- emergency rescue procedures
- safe methods of working on brittle and fragile material
- electrical safety
- maintaining record keeping procedures and systems.

Training in the use of fall injury prevention systems

Where a fall injury prevention system is used, the instruction and training given should include at least:

- what each individual piece of equipment is intended for and how it works
- the correct selection, fitting, use, care, inspection, maintenance and storage of individual fall arrest and restraint equipment (in accordance with the manufacturer's instructions), their strengths and weaknesses and the siting of temporary fall arrest systems
- the method to be used in carrying out a specified work task, including the access and attachment method
- maintenance of evidence of training undertaken
- emergency rescue procedures.

AS/NZS 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance* provides further information. Also see Section 19 Emergency rescue procedures.

4 Supervision

Employers must provide supervision to ensure that employees are not exposed to hazards and that they are taking reasonable care where there is a risk of falling from, through or into any place or thing.

Supervision by a competent person is important, especially if the people being supervised are undergoing training or are unfamiliar with the working environment.

Competent person is defined in the Foreword.

Employers should monitor the work to ensure that agreed safe work practices are followed; for example, monitoring the use and care of fall injury prevention systems.

Supervision of the use of fall injury prevention systems

Where fall injury prevention systems are used, the employer must ensure that:

- only employees who have received training and instruction in relation to the system of work are authorised to carry out the work
- employees use the fall injury prevention system in the correct manner
- adequate safety and health systems are in place, are functional, and safe work practices have been adopted and are used.

Employees must follow instructions

It is also important to ensure employees understand that they must comply, so far as they are reasonably able, with instructions given by their employer, where those instructions are for their own safety and health or for the safety or health of other persons [section 20 of the Act].

5 Design and planning of plant, buildings and structures

Any person designing and planning a plant, building or structure has a general 'duty of care' to ensure that the design and construction allows people to properly construct, maintain, repair, service or use the plant, building or structure in a safe manner [Section 23 of the Act].

The aim of the duty of care obligation is to ensure that designers and builders of buildings and structures or designers, manufacturers, importers or suppliers of plant eliminate completely or significantly reduce risks before they actually reach the workplace.

This duty of care also extends to any person who may be involved in the modification, renovation, maintenance or normal operation of a plant, building, structure or plant.

Therefore, at the design and planning stage, it is important to give consideration to prevention of falls systems, not only for use during the construction stage, but also for use during the maintenance of the plant, building or structure.

To ensure that risks to safety and health are considered fully during the design and planning process, designers or architects should:

- identify hazards associated with the design of the plant, building or structure that may arise while it is constructed and maintained, to which a person at the workplace is likely to be exposed
- assess the risk of injury or harm to a person resulting from the hazards arising as a result of the design
- consider the means by which the risk may be reduced.

5.1 Plant (machinery, equipment and vehicles)

Designers, manufacturers, importers or suppliers of plant must eliminate or significantly reduce risks before they actually reach the workplace. Thoughtful design of plant can eliminate risks of falls from heights from the beginning.

The definition of 'plant' in the Act includes any machinery, equipment, appliance, implement or tool and any components or fittings of the plant. Therefore, the duty of care obligations for the safe design and manufacture of plant apply to a wide range of items, including farm machinery, transport vehicles, overhead conveyor systems and port loaders.

The elimination or reduction of risks of falls from plant might include:

- providing adequate steps and handrails on a transport vehicle
- incorporating a fall injury prevention system in silos and overhead conveyors
- ensuring workers who will be maintaining or cleaning the plant are able to do so safely
- considering the safety of passengers.

Careful manufacture can also ensure the plant is as safe as the designer intended it to be, thus significantly reducing the chances that people may be exposed to risks of falls.

Providing information on hazards and safe use of plant is vital. This can make users aware of any risks the designer has been unable to eliminate and ensure that users do not create any new risks of falls by not using the plant properly.

5.2 Buildings and structures

Designers or constructors of buildings or structures must ensure that workers who will be involved with the construction, use or subsequent maintenance work are not exposed to risks of falls. Therefore, at the design and planning stage, it is important to consider providing fall prevention systems as part of the building or structure.

A 'building or structure' is defined in the Regulations as any erection, edifice, wall, chimney, fence, bridge, dam, reservoir, wharf, jetty, or ship or other floating structure, and includes any part of any of these things.

As it is unlikely that all design work on larger projects will be carried out by one designer, liaison should occur between the builder and other designers so that the work can be coordinated to ensure the safe interaction of the different design aspects.

When risks remain in the design work, information must be included with the design to alert others to the risks. Providing information about safety issues is a key component to ensure proper, adequate and suitable design and installation.

Design and planning checklist

Safety considerations for the design and planning stage include:

- designing safe access to or egress from any work area including the roof
- providing permanent guard rails or edge protection (e.g. parapet walls)
- use of temporary work platforms (e.g. scaffolds and elevating work platforms)
- location, operation, servicing and replacement of plant and equipment
- provision of suitably located temporary and permanent anchorage points and struts with safety line attachment to hook harnesses and lanyards for the use of fall injury prevention system
- safer building design with, for example:
 - low level mounting of roof vents
 - location of air conditioning units and other roof mounted plant, such as satellite dishes, away from the edges of the building
 - non-fragile material for the roof
 - permanent safety mesh for fall protection
 - safer gutters; e.g. installing large volume gutters and downpipes and gutter boards (made of material strong enough to prevent persons falling) on large gutters, and locating gutters away from the edges or at ground level
- specific safety requirements for workers doing subsequent installation, maintenance or repair work, for example:
 - people installing and maintaining antennae and satellite dishes
 - contractors servicing air conditioning equipment on the roof
 - people cleaning windows and gutters
 - people repairing the roof or gutters
 - the pre-fabrication of structures on the ground before they are lifted into position
 - assessment of how close construction plant will have to go to roads or overhead powerlines.

6 Access to and egress from work areas

If people are required to work in areas where there is the risk of falling, employers must provide a safe method for people to get to and from and move around that work area. This should take into account the tools and equipment which people will be required to carry to, from and around the work area and areas where plant is being used [regulations 3.6 and 3.7].

Safe access, egress and movement around a work area checklist

In providing safe access to and egress from and movement around a work area, the safety considerations include:

- installation of fixed work platforms, walkways and stairways
- use of temporary work platforms such as scaffolds
- installation of a fall injury prevention system
- frequency and number of people who may need to use the access to or egress from the work area. Supervision and regular inspection should also be considered
- location and space required for any plant, equipment or materials used or temporarily stored
- safety of work surfaces
- operation of plant by trained and competent operators who hold relevant certificates of competencies
- method of getting plant, equipment and materials to the work area
- exposure of access ways to the weather (e.g. rain can make surfaces slippery and strong winds can cause loss of hand grip)
- assessment of manual handling tasks, including considering the provision of mechanical lifting aids
- provision of adequate natural or artificial lighting to all access ways
- clearance of obstructions so that people are able to move easily to and from the workplace.

See also Section 16 Freight transport and general plant.

7 Edge protection

Edge protection (often referred to as a 'guard rail system') is used to reduce the risk of a person falling from one level to another.

Edge protection must be provided to the edge of a scaffold, fixed stair, landing, suspended slab, formwork or falsework at the workplace, where a person is at risk of falling two or more metres.

See also Section 8.7 Scaffolding.

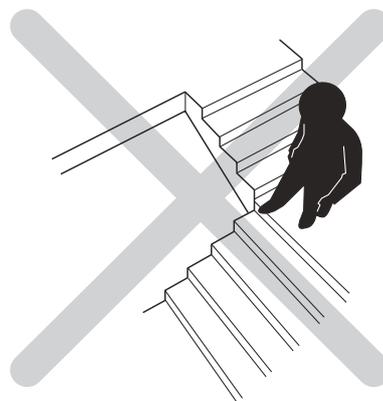
Edge protection or a fall injury prevention system must also be provided at any other edge at the workplace where a person could fall three metres or more, according to set requirements, which are listed in the following checklist [regulation 3.55].

Edge protection checklist

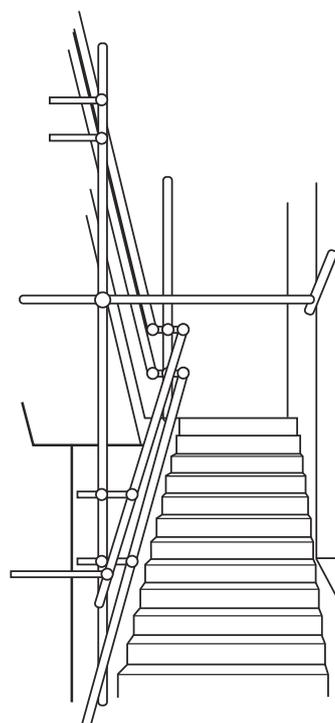
Safety considerations for edge protection include:

- the guard rail system must be constructed to withstand a force of 0.55 kN (approximately equivalent to 55 kg) applied at any point of it. If edge protection is to be used on roofs with pitches exceeding 15 degrees from the horizontal, the edge protection should be able to withstand the added impact forces
- top rails must be between 900 mm and 1100 mm above the working surface
- mid rails and toe boards must be provided. However, wire mesh infill panels incorporating a toe board may be used instead of the mid rail
- a bottom rail above the toe board on some roof slopes may be provided for more severe roof slopes. Both a mid rail and infill mesh panel will assist in preventing persons and objects from sliding off the roof
- the guard rails should comply with AS/NZS 4576 *Guidelines for scaffolding*
- if access points are required for equipment (e.g. a hoist), they should be protected adequately with gates or any other means to prevent a person falling
- where guard rail systems are intended to be used in conjunction with steel structures or tilt-up construction, designers and builders should plan for the guard rails and fixings to be attached to the panels prior to the structures being raised from the ground
- every open edge of a stair, landing, platform or shaft opening must be protected to prevent people falling.

AS 1657 *Fixed platforms, walkways, stairways and ladders – Design, construction and installation* provides further information.



Unprotected stairways are a severe hazard

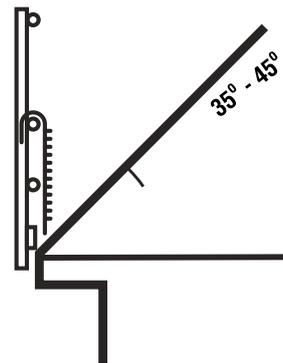
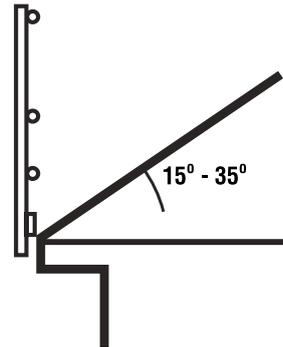
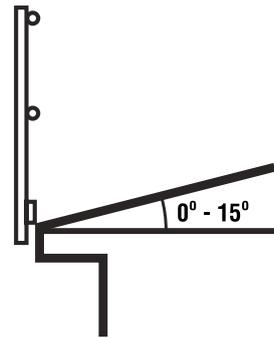


Stairways must have handrails and toe (fender) boards on the landings and baggings fitted over the ends of tubing and over couplings

Different degrees of roof slopes

With different degrees of roof slopes, the guard rail systems should incorporate the following:

- a top rail, mid rail and toe (fender) board, when roof slopes are between 0 degrees to 15 degrees from horizontal
- a top rail, mid rail, bottom rail and toe board, when roof slopes are between 15 degrees and 35 degrees from horizontal. The bottom rail should be fitted midway between the mid rail and the roof
- a top rail, mid rail, bottom rail, toe board and infill mesh panel to mid rail height, when roof slopes are between 35 degrees and 45 degrees. The infill mesh panel may assist in reducing injury to a person sliding down the roof into the railing and will minimise the possibility of objects falling from the roof. Where people are likely to be working below the edge of the roof at ground level, consideration should also be given to the use of infill mesh on roofs with flatter slopes
- where roof slopes exceed 45 degrees, the slope is unsuitable to work on without a support system, such as a fall arrest/restraint system or a scaffold catch platform, to prevent injury.



8 Fall injury prevention systems and anchorages

8.1 An overview

'Fall injury system' means a system designed and tested to arrest a person's fall from one level to another and also minimise the risk of injuries or harm during the fall. 'Anchorage' means an anchorage point for a fall injury prevention system (i.e. the means for attaching a lanyard, lifeline or other components of the system to a secure point) [regulation 3.48].

Fall injury prevention systems include:

- restraint systems
- fall arrest systems
- catch platforms
- scaffolding
- safety nets
- safety mesh.

A fall injury prevention system must be used where a person could fall three metres or more from an edge at a workplace, unless edge protection complying with the Regulations is used [regulation 3.55].

Consideration should also be given to slip resistance surfaces or coatings that render the surface trip or slip free to eliminate, where possible, any chance of a slip or trip or fall.

Key points on the use of the fall injury prevention systems

Choosing the most appropriate fall injury prevention system is essential. Points to consider include:

- correct selection, installation and use of equipment is critical to their effectiveness when arresting a fall
- the fall injury prevention system and the anchorages must be designed, manufactured, constructed, selected or installed so as to be capable of withstanding the force applied to them as a result of a person's fall [regulation 3.50]
- correct fitting of the equipment worn by a person is equally important as the connection of the equipment to the fall arrest system
- fall injury prevention systems should be such that a person falling travels the shortest possible distance before having the fall arrested

- ensuring the lanyard and harness are actually connected to the fall injury prevention system is critical (rather than just wearing the equipment)
- fall arrest equipment must not be used after it has arrested a fall until it has been inspected and certified as operational by a competent person
- fall injury prevention equipment should be appropriately stored when not in use.

The AS/NZS 1891 *Industrial fall arrest systems and devices series* provides further information on fall arrest systems.

Marking of fall arrest systems with instructions and other relevant information.

It is recommended that the AS/NZS 1891 series is consulted for requirements for personal fall arrest and restraint equipment to be permanently marked or labelled to indicate their purpose, correct use and limitations.

The aim of this marking and labelling is to reduce the incidence of misuse or misfitting of the equipment. It is important to maintain the legibility of these instructions through the life of the equipment.

8.2 Restraint systems

A restraint system comprises:

- anchorage point(s)
- a static line or restraint line of appropriate strength and length
- a harness or restraint belt.

Its purpose is to limit horizontal movements from an anchorage point or a horizontal life line or life rail so that the user is totally restrained from reaching a position where either a free fall or limited free fall is possible. Preventing a person from falling by use of a restraint system is the preferred method.

A restraint system is suitable for use where:

- the user can maintain secure footing without having to tension the restraint line and without the aid of any other handhold or lateral support. When deciding whether secure footing can be maintained, consider:
 - the slope of the surface
 - the supporting material type
 - the surface texture of the surface and whether it is likely to be wet, oily or otherwise slippery

- the static lines are fitted with an industrial shock absorber when required
- the restraint system conforms with the AS/NZS 1891 series.

8.3 Fall arrest systems

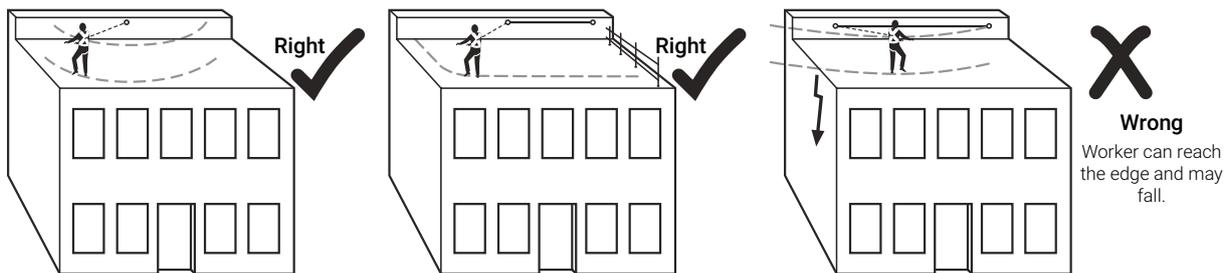
Individual fall arrest systems are designed to arrest an accidental fall and consist of some or all of the following:

- anchorages
- lifelines
- inertia reel
- lanyard that will not allow a person to fall more than two metres
- retractable lifelines
- rope grabs
- wire grabs
- rail system
- shock absorbers – both personal and industrial
- harness
- snap hooks (double or triple action to prevent rollout)
- karabiners (double or triple action to prevent rollout)
- rescue equipment.

Use of a fall arrest system instead of a restraint system

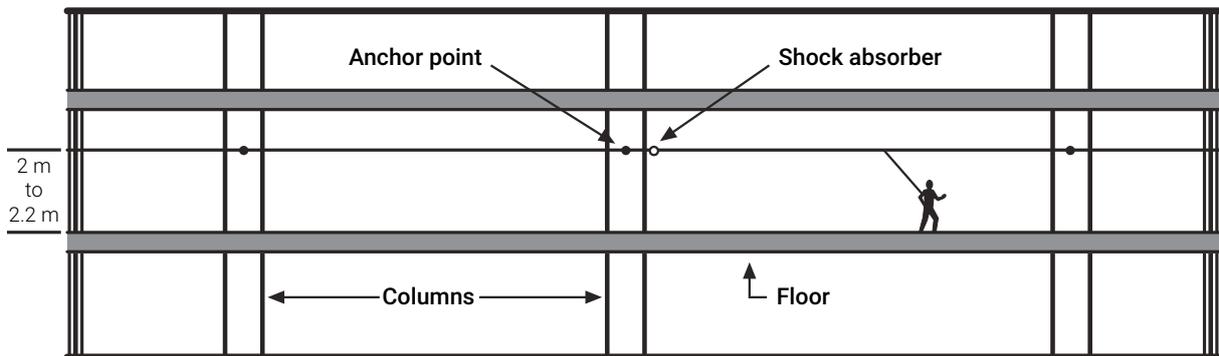
A fall arrest system should be used instead of a restraint system if any of the following situations apply:

- the user can reach a position where a fall is possible
- the user has a restraint line that can be adjusted in length so that a free fall position can be reached
- there is a danger of the user falling through the surface (e.g. roofing material)
- the slope is over 15 degrees
- there is any other reasonably likely misuse of the system which could lead to a free fall.



Left and centre: acceptable use of a restraint system. Right: unacceptable use of a restraint system.

See Appendix 3 and Appendix 4 for more details on restraint systems.



Fixed static line fitted with a shock absorber for use with safety harnesses and lanyards.

See Appendix 3 and Appendix 4 for more details on fall arrest systems.

Fall arrest system installation checklist

When planning the site layout and sequence of construction for installing a static safety line system, the safety considerations include:

- selection of the most appropriate fall arrest system and method of installation
- provision of anchorage points (see Appendix 4 for details of static lines capable of supporting imposed loads)
- requirements for lateral and vertical mobility whilst a person is connected to the system and working
- potential for different types of falls (e.g. free fall and restrained fall)
- fall distances and clearances (both vertically and laterally)
- provision of safe access to and egress from a work area for persons installing anchorage points
- installation in a location where it will be possible to assist or rescue a person
- development of emergency rescue procedures before setting up and ensuring appropriate emergency equipment is available on-site, including a self-rescue kit (if training in its use has been provided), although these should not be relied on as the main means of rescue.

Fall arrest and industrial rope access systems should be only installed where it is possible to provide prompt assistance or rescue if required. See Section 19 Emergency Rescue Procedures.

Refer to the specifications in the AS/NZS 1891 series for further information.

Safe access to and egress from the work area

Before work commences, the employer or person who has control of a workplace and employees should ensure that there is safe access to and egress from the work area. This includes:

- assessment of wind and weather
- organising of:
 - fall prevention equipment
 - access
 - personal protective equipment
 - specific instructions for workers
 - means of rescuing persons from safety harnesses following arrested falls

- provision of a safe means of access to an anchorage point. This should take into account the possibility of a fall prior to the operator connecting securely to the anchorage and after disconnection at the conclusion of the task.

A person using a fall arrest or industrial rope access system should not work alone.

Signage

Signage should be in place permanently at entry points of static line systems to advise users on the fall prevention system and inspection details.

The signage should include statements on:

- the system it has been designed for (e.g. a restraint system or a fall arrest system)
- how many people should use the system at any one time
- any personal protective clothing and equipment the operator should wear
- the date of the last inspection
- the date of the next inspection
- the name of the person doing the inspections.

8.4 Inspection of fall injury prevention systems

Users of fall injury prevention systems must be aware that fall prevention depends upon the continued efficiency and durability of fall injury prevention systems.

It is essential that all equipment is correctly maintained, with inspections and examination of all components by a competent person at regular intervals [regulation 3.51]. Competent person is defined in the Foreword. All fall injury prevention system equipment should have an established inspection regime for an effective inspection by a competent person.

Inspection of fall injury prevention systems checklist

The safety requirements and considerations include:

- the inspection regime should include details of:
 - equipment to be inspected (including its unique identification)
 - frequency and type of inspection (pre-use checks, detailed inspections and, where appropriate, interim inspections)
 - designated competent people to carry out inspections
 - action to be taken on finding defective equipment
 - means of recording the inspections
 - training of users
 - the system of monitoring the inspection regime to verify that inspections are carried out appropriately.

Employers should consult the manufacturer and/or supplier of the equipment for any product-specific requirements.

- the employer must ensure that each component of the system and its means of attachment to an anchorage is inspected by a competent person:
 - after it is installed but before it is used
 - at regular intervals
 - immediately after it has been used to arrest a fall [regulation 3.51].

If any signs of wear or weakness are found during the inspection, the employer must ensure that the components or means of attachment are withdrawn from use until they are replaced with properly functioning components. The manufacturer's specifications for inspections should also be checked for their recommendations on inspection intervals:

- all safety belts and harnesses, which are not in regular use during any six month period, are inspected before use
- the fall prevention systems are inspected at least once every 12 months and after any extended storage period

- consideration is given to environmental factors that may have affected the condition of equipment, such as water, oil, grease, sharp edges and grit
- there is consultation with the manufacturer if there is any doubt that a belt or harness could be affected by cleaning materials, atmospheric contaminants or hazardous substances.

If a fall injury prevention system has been used to arrest a fall, it must be withdrawn from service immediately and inspected by a competent person.

Inspection of anchorages

Employers must ensure that a permanently fixed anchorage is inspected by a competent person and it is regularly inspected, at not less than six month intervals, if it is permanently fixed and in regular use [regulation 3.53].

If a permanently fixed anchorage is not in regular use, it must be inspected before it is used.

When the competent person doing an inspection assesses the anchorage as being impaired, the employer must ensure that:

- the anchorage is not used and is tagged to indicate it is not to be used
- the repaired anchorage is not used until it is inspected by a competent person who can confirm that it is safe to use.

All anchorages should be visibly checked prior to use.

Inspections for faults and condition

Inspections of inertia reels checklist

Inspections of inertia reels by the competent person should include inspecting:

- the rope or webbing including anchorage lines in Type 2 and 3 fall arrest devices (e.g. inspecting for any defects or damage and checking the anchorage)
- the fall arrest device body (e.g. inspecting for any damage to the mounting ring or the body, checking the activation of the fall arrest indicator and that labels are present)
- the locking mechanisms and rope guides (e.g. inspecting the visible rope guides for excessive wear and checking that the rope runs freely through the anchorage and that the locking mechanisms work properly)
- the hardware (e.g. checking that the snap hooks or links work properly)
- the snap hooks and double or triple action karabiners (e.g. inspecting for any damage and checking the movement of the latch).

Inspection of harnesses checklist

The inspection of the harnesses by the competent person should include inspecting:

- the webbing (e.g. inspecting for any damage or defects)
- the D rings (e.g. inspecting for any damages or wear and tear and checking the vertical movement)
- the buckles and adjusters (e.g. inspecting for any damage).

Consulting the inspection checklist for possible faults and the condition of fall arrest devices, belts and harness in AS/NZS 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance* is recommended, as well as the inspection checklist for static lines and anchorages in AS/NZS 1891.2 Supp. 1 *Industrial fall arrest systems and devices – Horizontal lifeline and rail systems – Prescribed configurations for horizontal lifelines*.

See also Appendix 4 Components of fall arrest and restraint systems.

Inspections before work starts

Items in the fall injury prevention system to inspect or check before work starts include:

- lifeline lanyards or rope grabs are attached as per manufacturer's instructions
Note that some harness attachment points may not be rated for fall arrest
- if a lifeline is being used with a rope grab, ensure that the rope and all rope grabs are compatible, especially with regard to rope diameter and direction
- when setting up the fall arrest equipment, inspect it for sharp edges, pinch points and sources of heat, which could wear, cut or burn through the lanyard if a worker should fall and be left dangling
- ensure an emergency rescue procedure is in place
- ensure that there is always assistance from another person when the fall arrest equipment is in use. People who are working at a height or an elevated position should not work alone. This is important if there is a risk of a fall
- ensure that there is no climbing above the anchorage point of a fall arrest lanyard since the falling distance could double
- ensure that fall restraint components are not mixed with fall arrest components. Fall arrest components must incorporate a shock absorber
- do not allow fall restraint anchorage points, which have a much lower strength requirement, to be confused with fall arrest anchorage points. Attach signs at each anchorage point indicating the type of anchorage point (i.e. whether it is for fall restraint or fall arrest)
- always inspect the snap hook visually after attaching it to a harness or anchorage point; merely hearing it click is not enough. There have been fatal accidents in which it was later found that the connector had not been closed properly
- always set up the attachment point for fall arrest or fall restraint between the safe access point and the hazard. If a worker has to walk past the hazard to reach the attachment point, the purpose of the whole fall arrest system is defeated
- always inspect all fall prevention equipment and hardware before use and, if there are any doubts about the equipment, it should not be used because the boundary between safe and unsafe equipment is not well-defined. If the item is damaged, it must be taken out of service and inspected by a competent person prior to reuse.

Welding and the protection of fall injury protection systems

A large part of the equipment and components of fall injury prevention systems consists of material which may be badly damaged and weakened by hot particles or sparks from welding or any allied process. Therefore, people using the system and the system itself must be protected from hot particles or sparks [regulation 3.52] with, for example, fire retardant harnesses and lanyards, lanyards with a cable wire core or fire retardant blankets.

8.5 Hazards with the use of fall arrest systems

Pendulum effect

With the use of a fall arrest system, a potential hazard is that, in some situations, the worker may swing onto the ground (which is called 'swing down') or swing back into the building (which is called 'swing back'). These hazards are caused by two lines offsetting one another, i.e. the line from the anchorage point to the worker and the line (direction) of the fall.

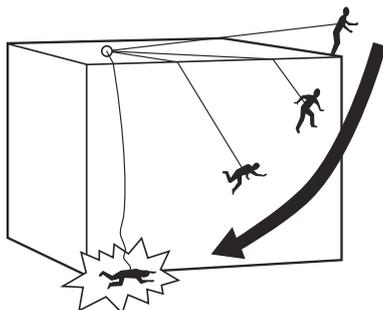
Consider the pendulum effect before deciding on location of anchorage points. Both swing down or swing back can also occur within the interior of a roof.

Swing down

With the hazard of swing down, the fall arrest line extends diagonally from the anchor point, following the perimeter edge of the roof. If the worker falls, the fall arrest line will slide back along the perimeter until it is at a right angle with the edge of the roof. When this happens, the worker will drop and may hit the ground (see diagram right) or the arrest line may break when contacting the edge of the roof and the worker will fall to the ground.

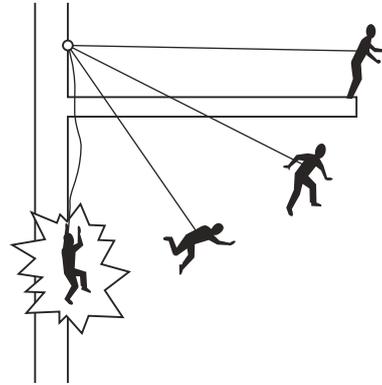
Consideration should be given to the following measures to address the hazard of swing down:

- install guardrails
- put the anchorage point at a right angle to the position of the line at the perimeter edge. The use of a mobile anchorage will assist
- install a second anchorage point and belay devices, which are intermediate anchorages.



Swing back

With the hazard of swing back, in a fall, particularly from a perpendicular edge, the worker will swing back into the building structure and collide with any obstructions in the path of the swing.



If there is a risk of swing back occurring, then the use of an individual fall arrest should be reassessed.

Assistance of another person

People who are working at a height or an elevated position should not work alone. This is important if there is the risk of a fall. A person suspended in a full body harness must be rescued as soon as possible.

Workers must be trained in rescue techniques and be familiar with on-site rescue equipment and emergency rescue procedures.

Suspension trauma

Suspension trauma may occur when a person has an arrested fall because they are suspended and caught in an upright position. Section 19.1.1 has more information on suspension trauma.

For information on other hazards with fall arrest systems, see Appendix 4 Components of fall arrest and restraint systems.

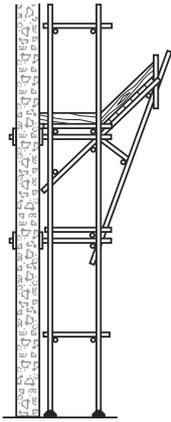
8.6 Catch platforms

A catch platform is a temporary platform located below a work area. It may be constructed of scaffolding components.

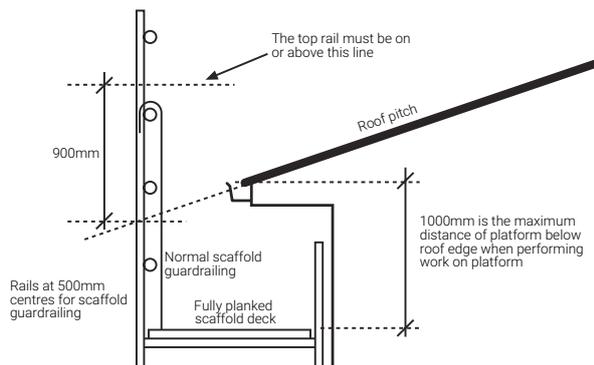
Catch platforms must be solidly constructed and designed to withstand the maximum potential impact load.

When scaffolding components are used, the catch platform should:

- have a deck that is fully planked out and is as close as possible to the work level
- be no more than two metres below the work area
- extend a minimum of two metres beyond all unprotected edges of the work area
- at a minimum, be the width of the area being removed (e.g. in roof laying work).

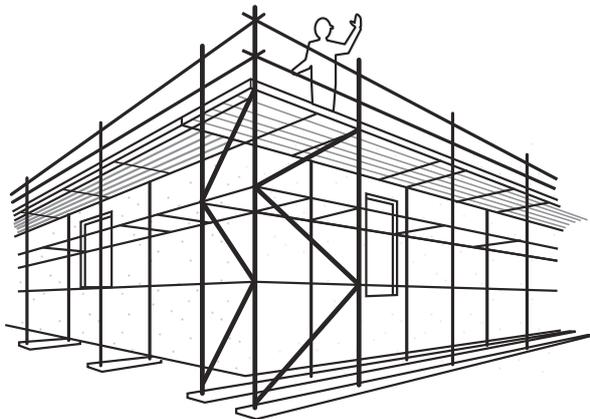


A catch platform below a work area.



Example of a combination of work platform and catch platform for roof pitch of 26 degrees or less.

8.7 Scaffolding



Perimeter scaffold with a fully decked working platform, guard rails and toe boards

Scaffolding can be very effective protection in preventing falls; however, there are specific requirements that apply to the design, construction and erection of scaffolding.

The AS/NZS 4576 and the AS/NZS 1576 series on scaffolding provide practical guidance on training, safe work practices, inspection and use of scaffolding and scaffolding equipment.

Different duties for scaffolding

Scaffolding work platforms are generally rated as light, medium or heavy duty.

'Light duty scaffolding' is scaffolding of up to 225 kg per bay. This is suitable for plastering, painting, electrical work and other light tasks. Platforms must be at least two planks (450 mm) wide.

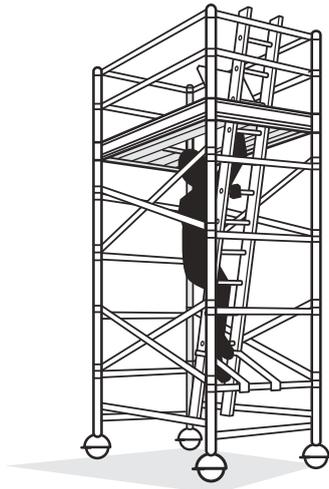
'Medium duty scaffolding' is scaffolding of up to 450 kg per bay. This is suitable for carpentry and most other general trades work. Platforms should be at least four planks (900 mm) wide.

'Heavy duty scaffolding' is scaffolding of up to 675 kg per bay. This is needed for bricklaying, concreting, demolition and most work tasks involving heavy loads or heavy impact forces. Platforms should be at least five planks (approximately 1,100 mm) wide.

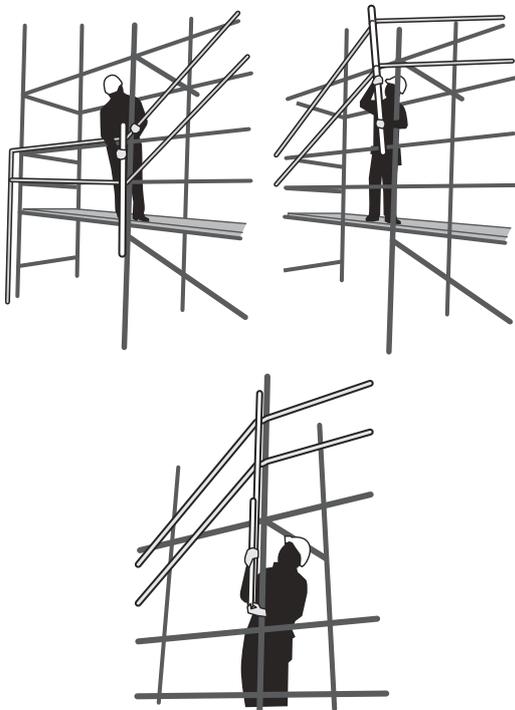
Scaffolding checklist

The safety requirements and considerations include:

- scaffolding must conform to AS/NZS 4576 and AS/NZS 1576 series
- if scaffolding is to be erected or dismantled at a height exceeding four metres, the scaffolding must be erected or dismantled by a person licenced to perform high risk work
- a person must not alter scaffolding without authority from the main contractor
- modular scaffolds must be of the same type, not mixed components. Mixed components from different manufacturers have resulted in scaffold incompatibilities and failures, posing significant risks to persons using the scaffolding
- mobile tower frame scaffolds can be used to provide safe working platforms
- scaffolding that is incomplete and left unattended should have danger tags and warning signs attached at appropriate locations to prevent use
- scaffolding exceeding four metres in height should be inspected and tagged by a competent person before use, after any alteration or repair, and at intervals not greater than 30 days
- additional inspections should be carried out by a competent person following an occurrence such as a severe storm or earthquake
- safe access to and egress from the scaffold must be provided
- edge protection (guard rails and toe boards) must be provided at every open edge of a work platform.



Mobile scaffold, access ladder and trapdoor to provide the maximum size hazard-free working platform. Toe board not shown for clarity of diagram.



Example of 'advanced edge protection' where guard railing is installed before the person goes up to the next level.

Edges of a roof

Scaffolding may be used as fall protection around the edge of a roof by incorporating guard railing as edge protection into the scaffolding. The following diagrams show common examples of acceptable roof guard railing arrangements on scaffolding. The toe boards are not shown for clarity of diagrams.

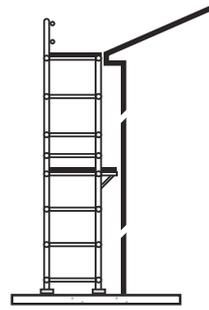


Figure 1
Scaffold platform at edge of roof with hop-up bracket for other trades.

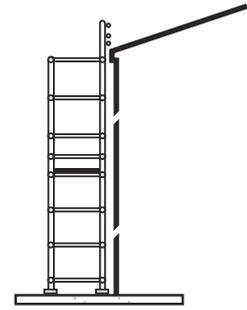


Figure 2
Inside standards supporting guard railing.

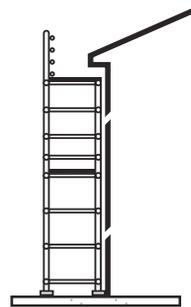


Figure 3
Scaffold platform below edge of roof.

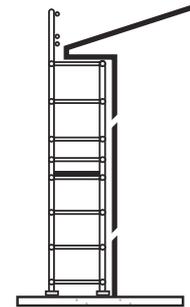


Figure 4
Outside standards supporting guard railing.

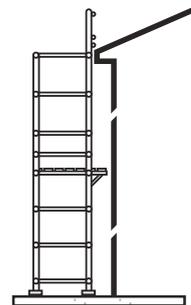


Figure 5
Inside standards supporting guard railing with hop-up bracket for other trades.

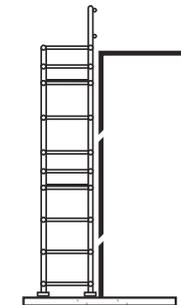


Figure 6
Inside standards supporting guard railing adjacent to a flat roof structure.

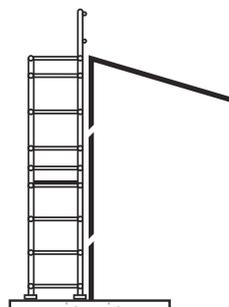


Figure 7
Inside standards supporting guard railing adjacent to a roof structure that slopes away from the top edge.

8.8 Safety nets

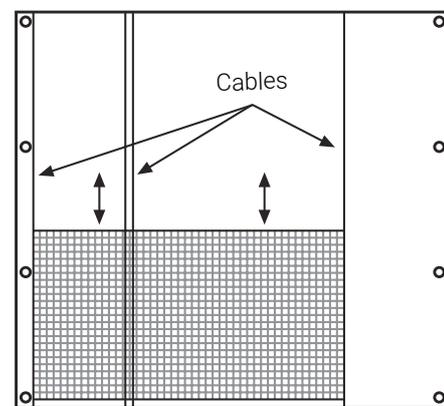
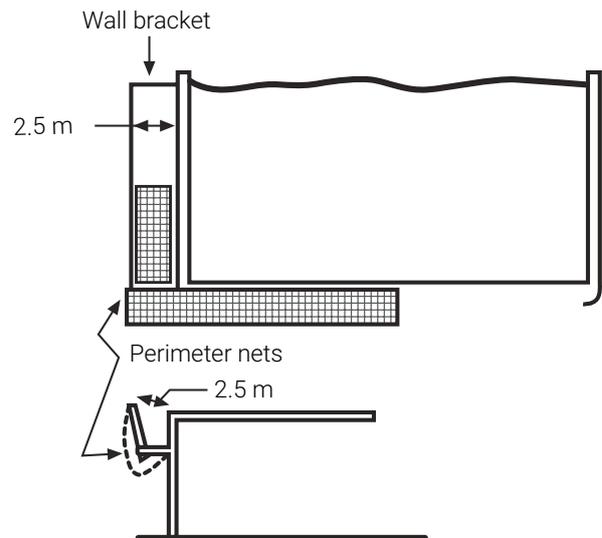
Safety nets can provide a satisfactory means of protection against fall injuries while allowing workers maximum flexibility of movement. They should not be used for access to or egress from a work area or as a working platform.

Information on safety nets is included in AS/NZS 4576. British Standards BS EN 1263.1 *Safety nets – Safety requirements, test methods* and BS EN 1263-2 *Safety nets: Safety requirements for the positioning limits* also provide specifications for the safe use and installation of safety nets.

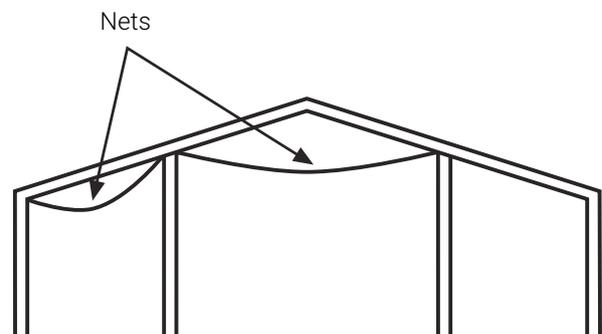
Safety nets checklist

Where safety nets are used as a fall injury prevention system, employers should ensure that:

- safety nets are in position before any work is commenced
- safety nets are constructed of material of sufficient strength to catch a falling person or debris
- safety nets are installed and maintained by a certificated rigger or scaffolder
- elevating work platforms (e.g. a cherry picker or scissor lift) are used for the installation. If this is not possible, scaffolding and fall arrest systems should be used
- safety nets are hung as close as is practicable to the underside of the working area, but no more than two metres below the working area
- perimeter safety nets extend at least 2.5 metres beyond the leading edge of the working area (see the diagrams below)
- perimeter safety nets are installed where there is no edge protection to prevent workers falling over the edges
- where cables are installed along the length of the building or structure, safety nets are hung across these cables and moved along as the work proceeds
- the safety net has sufficient tension and clearance to prevent a falling person contacting any surface or structure below the net
- combustible material is not allowed to accumulate in suspended safety nets
- no welding or oxy cutting is performed above safety nets
- safety nets are not used in an environment that exposes them to damage from chemicals, sun or heat
- safety nets are inspected, particularly after installation, relocation or repair
- the safety nets are stored correctly in dry, shaded areas. Good air circulation is also necessary.



Safety nets – plan view



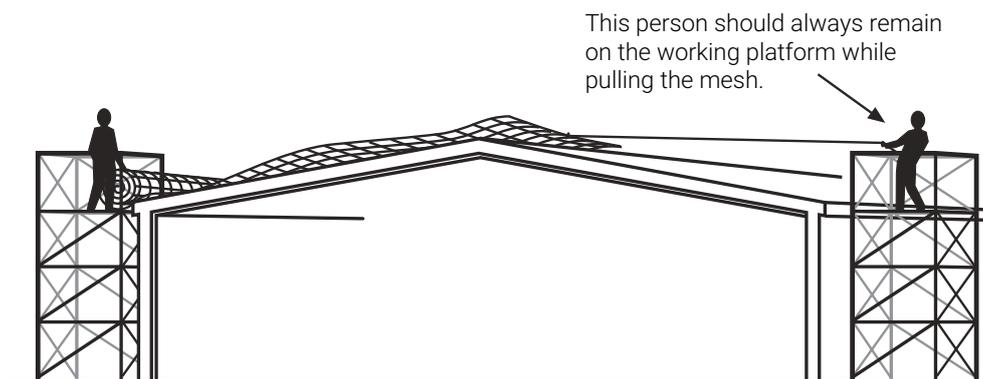
Safety nets – end view

8.9 Safety mesh

Galvanised safety mesh securely fixed provides fall injury protection for roof installers and offers long-term protection for maintenance and repair workers.

The removal of roofing materials and safety mesh for the replacement of the roof or for demolition must be carried out in the reverse sequence to the way it was constructed initially. This means that:

- the sheeting should be removed first so that the safety mesh remains intact to provide maximum protection for the removal workers
- then the safety mesh should be removed.



Means of installing safety mesh across the roof, prior to fixing it in position. Rope is used to pull mesh across the roof purlins. Do not walk across open purlins to draw the mesh. Edge protection is not shown for clarity of diagram.

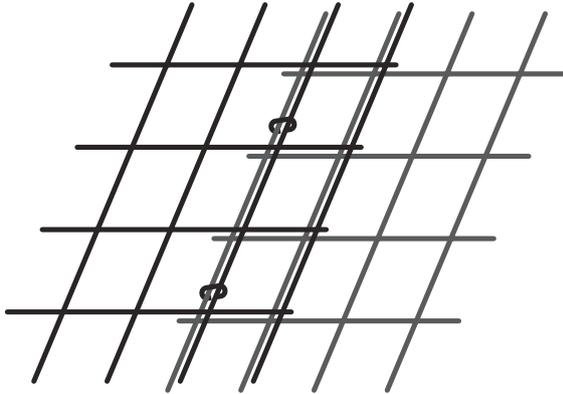
Safety mesh checklist

The safety considerations include:

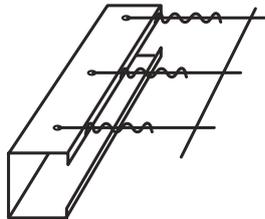
- safety mesh must be used in conjunction with appropriate guard rails or fall arrest systems and devices when people are working close to open edges of a roof
- the safety mesh should comprise 2 mm diameter wire of not less than 450 MPa tensile strength welded into a mesh
- the longitudinal wire spacing should not exceed 150 mm and cross wire spacing should not exceed 300 mm
- safety mesh should be installed by a competent person
- AS/NZS 4389 *Roof safety mesh* specifies the minimum requirements for the design, construction testing and installation of safety mesh in domestic, commercial and industrial building applications. Information is also contained in AS 2424 *Plastics building sheets – General installation requirements and design of roof systems*, which is a superseded (but still available) Australian Standard
- people engaged in the installation of safety mesh should be protected from falling by scaffolding (as in the diagram above), elevating work platforms and/or fall arrest systems and devices
- although not required when installation of safety mesh is carried out from properly erected scaffolding incorporating edge protection, fall arrest equipment is required to access the roof span
- installation of safety mesh and roofing material must be carried out in the correct sequence. Safety meshing must be completed and in place before roof sheets are moved into position
- a rope should be used to draw the mesh across the open purlins from one side to the other. Do not walk or jump across the open purlins to draw the mesh across the roof
- the removal of roofing materials and safety mesh must be carried out in reverse sequence to the way it was constructed initially
- safety mesh should not be used for access to or egress from a work area or as a working platform.

Joining of wires in the safety mesh

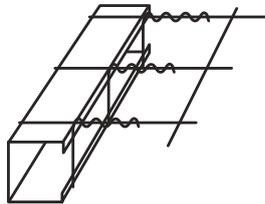
Adjacent runs of mesh must be overlapped one opening width.



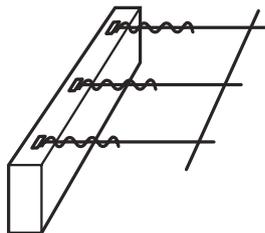
Top: Overlapping of adjacent runs of mesh by one opening width. Steel staples are required to fix runs of mesh where purlin spacing exceeds 1.7 metres.
Below: Means of fixing wire mesh to purlins, tied off with at least four full turns around the wire.



Longitudinal wires passed through holes drilled in steel purlins



Longitudinal wires wrapped around steel or timber purlins



Longitudinal wires passed through steel staples on timber purlins

Longitudinal wires

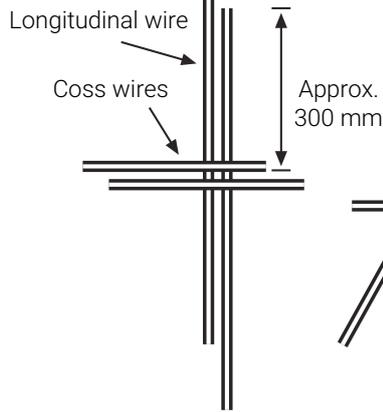
The joining of longitudinal wires must be done in a way that develops the strength of the connection of longitudinal wires to roof members.

If it is necessary to make longitudinal joins, the knot and tie should be the full length of the tail wire, which should be 300 mm in length.

The first tail wire should be tied at least three times around the knot.

The other tail wire is placed under the longitudinal wire and tied around the transverse wire. To get a 300 mm tail wire, cut the longitudinal wire close to a join. The join should be the full width of the mesh, with every longitudinal wire joined. The diagrams illustrate the tying procedure.

Step 1

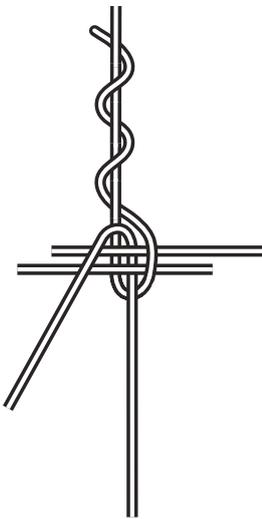


Step 2

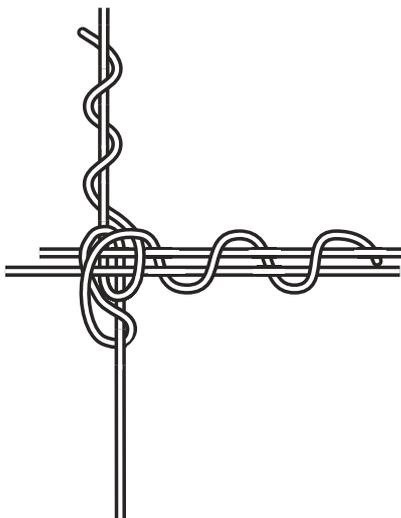
Cross wires

The runs of mesh should be side lapped by at least 150 mm (one opening width). If the purlin spacing exceeds 1.7 metres, the runs of mesh should be fixed with 2 mm steel staples or by tying or twitching at intermediate spacings. This is to prevent people falling through the meshed bays.

Step 3



Step 4



Method for joining longitudinal wires and cross wires (Steps 1-4).

Any variation to the recommended method of tying should be avoided.

9 Ladders: portable and fixed

Many falls from heights result from using items such as crates, stools or desks to access heights instead of properly setting up a ladder. However, each type of ladder has specific safety requirements and considerations.

Portable ladders

Extension or single ladders should be used as a means of access to or egress from a work area, not as a working platform [regulation 3.26].

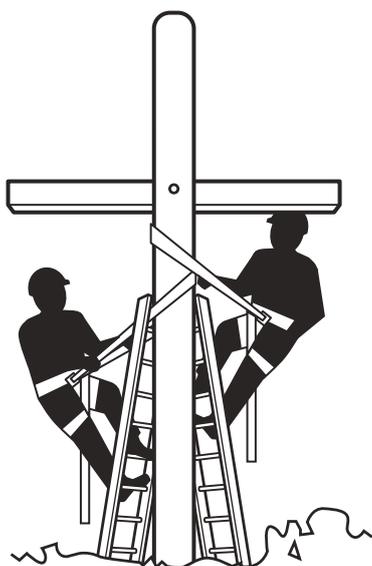
The Regulations set specific requirements for the use of a single or extension ladders, which are included in the checklist on the following pages.

In addition, the minimum recommended safe practices and requirements for the selection, safe use and care of portable ladders are set out in the AS/NZS 1892 *Portable Ladders series*.

Other means of preventing falls may be necessary with the use of portable ladders, where a risk assessment determines additional protection will be needed. The additional means of protection include:

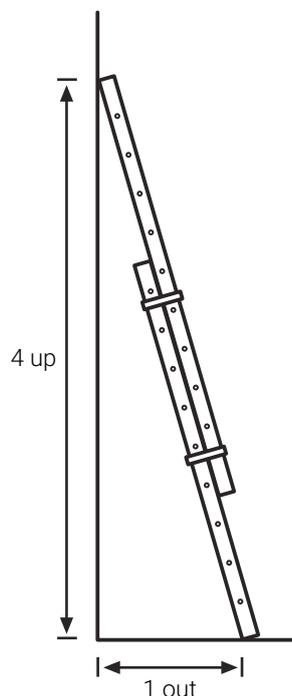
- use of a permanent or temporary fall arrest system attached to a ladder where a person may fall three metres or more
- use of pole straps (see the following diagram), which should be inspected regularly and at least daily when in use.
- the installation of fixed ladders.

For information on fall arrest systems, see Section 8 and Appendix 4. Refer also to the relevant section in AS/NZS 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance*.

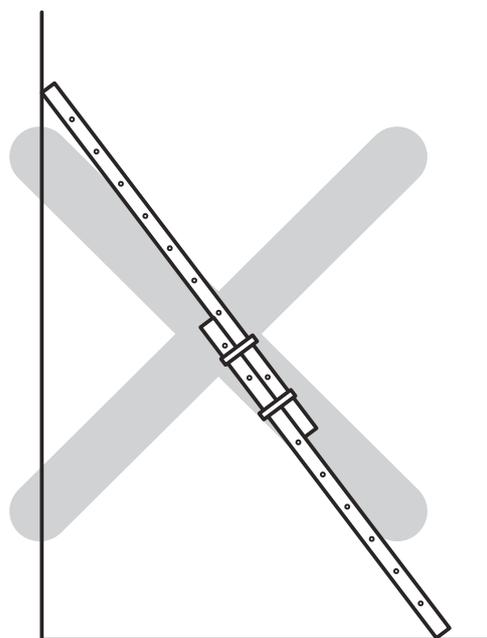


An example of pole straps used with portable ladders to provide fall protection. In this situation, a secondary independent anchor point should be used (this is not shown in the diagram).

Positioning of portable ladders

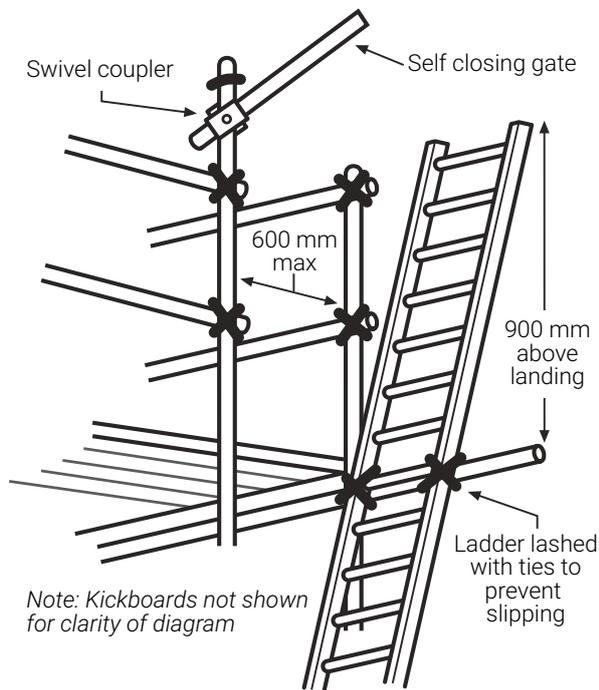


The distance between the ladder base and the supporting structure should be about one metre for every four metres of working ladder height. Horizontal benching of ground ensures vertical alignment of ladder.



Unsafe arrangement of ladder, which will create instability. Base of ladder positioned too far from wall. Sudden slipping can occur.

Always position the ladder so that the rungs are at a right angle to the edge of the working platform (i.e. the roof, scaffolding or gutter). The diagram below illustrates this point.



Ladders checklist

If a ladder is used, check that:

- the type of ladder is appropriate to the task. Industrial-rated ladders must be used in the workplace. Do not use 'domestic' or 'home-made' ladders
- all ladders must comply with AS/NZS 1892 series and users should follow the manufacturer's recommendations on safe use
- the ladder is in good condition. Before it is used, the ladder should be inspected for faults, such as broken rungs, rails and footing. Consult the manufacturer's checklist, if available
- damaged ladders are removed from service
- the ladder is on firm, stable and level ground
- the ladder is the correct height for the task to avoid reaching or stretching. Keep the body centred between side rails at all times. Never overreach
- platform ladders over two metres should have a drop bar type fall restraint

- the ladder is not too close or too far from the support structure. The ratio must be one to four. The distance between the ladder base and the supporting structure should be about one metre for every four metres of working ladder height (see the diagrams on the previous page)
- the ladder is secured against displacement (i.e. slipping or sliding) and/or there is another person holding the base of the ladder
- if used at a construction site, the ladder must not be suspended from a parapet hook
- the ladder is not placed so that the weight of the ladder and any person using the ladder is supported by the rungs (see the diagram on the next page)
- all the locking devices on the ladder are secure
- the ladder is always faced while climbing up or down
- materials or tools are not carried while climbing the ladder. Tools should be carried in a tool belt or side pouch
- only light duty work is undertaken while on the ladder, where three points of contact can be maintained and tools can be operated safely with one hand
- no person should stand on a ladder any higher than 900 mm from the top of the ladder
- no other person is allowed on the ladder at the same time
- slip resistant base, rungs or steps are provided
- slip resistant shoes are worn
- metal or wire bound ladders are never used close to energised power lines; non-metallic ladders should be used instead
- ladders are not used in access areas, next to doors when the work involves hot work (e.g. welding or oxy cutting), on scaffolding or an elevating work platform, next to power lines, in very wet or windy conditions and next to traffic areas unless the working area is barricaded.

Access or egress

Where fixed/extension ladders are used for access or egress, check that:

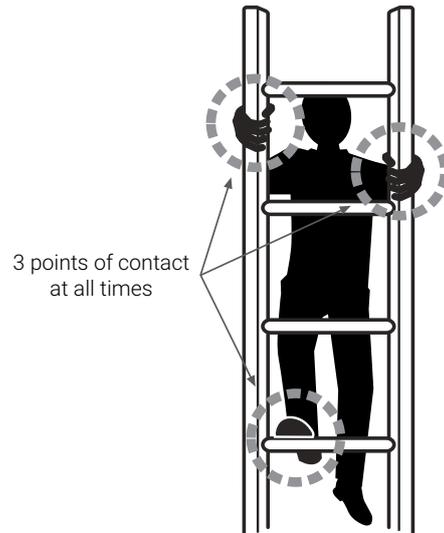
- they are used only for access to or egress from a working area, not as a working platform. Consider whether an elevating work platform or scaffolding would be safer
- there is a firm and level work platform, free from obstructions, to step onto from the ladder
- the ladder extends at least 900 mm above the stepping off point on the working platform. Sufficient platform area must be provided at the stepping off point
- edge protection is provided at the stepping off point where people access the working platform.

Working platforms

Where portable or fixed ladders are used as working platforms, check that:

- a fall restraint or arrest system is used, if the person is exposed to a fall of three or more metres. Refer to AS/NZS 1891.4 for anchorage requirements
- three points of contact with the ladder are maintained when accessing and egressing the ladder. This means that there should be two feet and one hand or two feet and the frontal D ring on the harness attached to the fall arrest/restraint line or inertia reel (see the diagram below).
- no work is carried out over another person. Ensure signage is used to warn people of work above.

See Appendix 2 for an example of a documented risk assessment of ladder use at a workplace.



Three points of contact with the ladder should be maintained at all times, i.e. two feet and one hand, two hands and one foot or two feet and the frontal D ring on the harness attached to the arrest/restraint line or inertia reel. Tools and materials should not be carried by hand. They should be in a tool belt or side pouch.



The ladder should not be placed so that the weight of the ladder and any person using the ladder is supported by the rungs.

Step and trestle ladders

Step and trestle ladders should be used only in the fully open position.

A step ladder may be used in the closed position by leaning against a support; however, care must be taken to ensure that the load is carried by the front stiles only.

Do not use step ladders as a working platform.

Alternatives to trestle ladders should be considered. There is a wide variety of working platforms now available for use in all circumstances, including small scissor lifts, light duty aluminium mobile scaffolds, boom arms and modular scaffolding.



A step platform can provide a stable work surface.

Trestle ladders must be used only for light duty work and the minimum width of the working platform should not be less than 450 mm. Work should not be performed on a trestle platform that is over two metres above ground level unless edge protection is incorporated.

Ladder bracket scaffolds

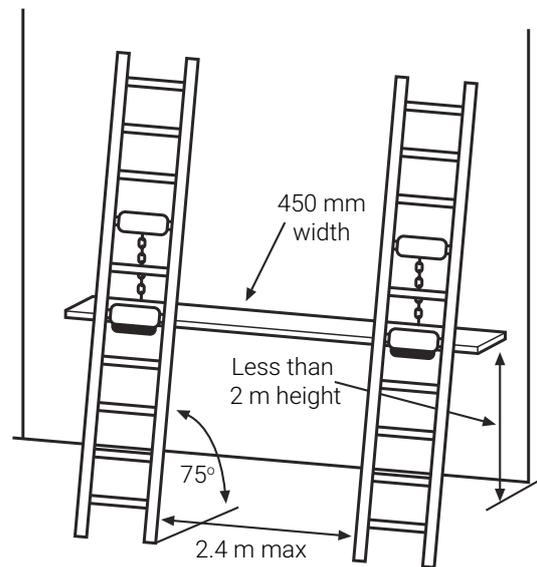
Alternatives to ladder bracket scaffolds should be considered because there are safer means of accessing heights of two metres, such as light duty scaffolding and elevating work platforms (e.g. scissor lifts).

Ladder brackets must not be used for general construction work.

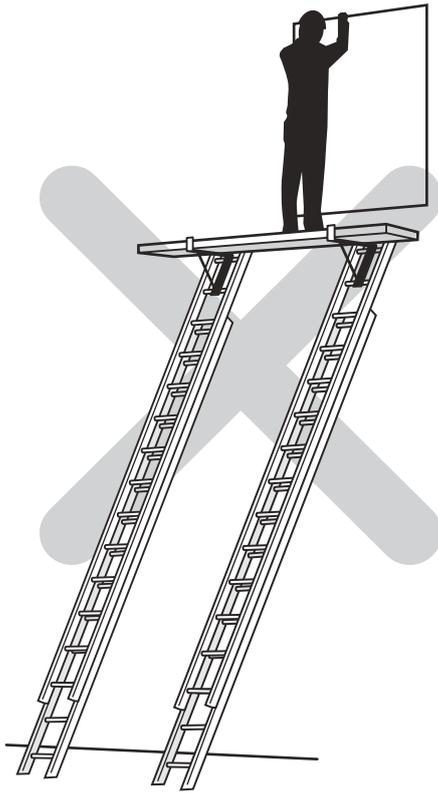
Ladder bracket scaffolds may be used only for very light work, where an alternative is not practicable, such as sign writing.

When ladder brackets are used, their use must be in accordance with clause 10.2.5 of AS/NZS 4576.

The platform on the brackets should be at least 450 mm wide (the minimum width of a light duty work platform).



Example of an acceptable ladder bracket scaffold.



An example of unacceptable use of a ladder bracket – the working platform must only be used for work of two metres or less in height. In this example, the brackets are mounted on the outside of the ladders. With the working platform required to be at least 450mm wide, the user would have to climb out over the working platform, without any hand hold points above the platform to support them while gaining access to the top of the working platform.

The leaning angle of the ladders is also greater than one in four (see the earlier diagrams under positioning of portable ladders) and the ladders may slip out at the bottom. In addition, edge protection and a handrail must be provided if a person can fall two or more metres from the platform (see regulation 3.55 in Appendix 3).

Fixed ladders

Ladder and tower safety systems should be installed on fixed ladders (e.g. rung ladders). More information on these systems is provided below and on the next page.

The ladder cages in fixed ladders have been shown not to stop a fall but simply funnel a fall and, in some cases, more injuries can occur from striking the protective backguards on the way down and the cages may also hinder rescues. Therefore, fixed ladders with angles exceeding 75 degrees to the horizontal should be fitted with a permanent or temporary fall arrest system.

Inertia reels may be used for providing fall protection on fixed ladders.

The ladder cages may also increase the risk of falling by giving the climber a false sense of security.

In areas where fixed ladders are installed, it is recommended they are in accordance with AS 1657.

The angle of slope should not be less than 70 degrees to the horizontal and not greater than 75 degrees to the horizontal. In no case should the ladder overhang the person climbing the ladder. If the angle is more than 75 degrees, a safe system of work to prevent falls should be provided such as a permanent fall arrest system (see ladder and tower systems on the next page) or a double lanyard harness.

A specifically designed rescue procedure should be developed for use in ladder cage situations, in consultation with the safety and health representative, if any, and employees. Training in the rescue procedures should occur prior to the use of the fixed ladder.



With the use of a ladder tower system, the person climbing has continuous fall protection by being attached to the anchorage by a drop line and harness.

Ladder and tower safety system checklist

Safety considerations include:

- temporary systems should comply with the requirements of droplines (see Appendix 4)
- the locking device should be attached to the side or frontal attachment point of the harness and the lanyard assembly should be a maximum of 300 mm length
- the locking device should not be capable of damaging the line in the event of a fall
- the point of connection onto the ladder by the climber must be near the base of the ladder to allow the connection before ascending begins and also to provide continuous connection to the disconnecting point when at a safe higher level
- limited free fall should be to a maximum of 600 mm
- permanent systems should be of wire or rail construction and should be installed according to the manufacturer's instructions
- the entire device should be capable of sustaining a load of 12 kN (approximately equivalent to 1200 kg).

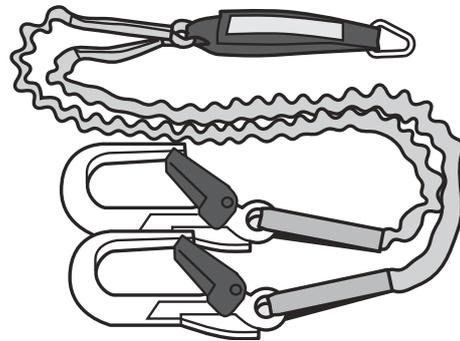
It is recommended that:

- wire systems are in accordance with AS/NZS 1891.3 *Industrial fall arrest systems and devices – Fall arrest devices* and AS/NZS 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance*, and sited in the middle or side of the ladder
- rail devices are anchored in accordance with AS/NZS 1891.3. They should be sited to allow clearance of the self-locking device. Junction points may be installed to allow both vertical and horizontal movement.

Double lanyards

An alternative to ladder and tower systems is the use of a double lanyard (also known as a twin tail or 'Y' lanyard). The diagram below shows how the use of a double lanyard means that the person climbing can always be connected to the ladder or structure and, if there is a fall, it should be a short distance.

However, double lanyards are easy to misuse. A common and widely accepted method of misuse for a double lanyard is the incorrect stowing of the unused leg which could result in equipment failure in the event of a fall. There should be no back hooking, they are not suitable for frequent use (because of possible misuse or muscle injury) and the ladder or structure points must be capable of arresting forces generated by a fall with the double lanyard. Adequate training must be provided on their use.



An example of a double lanyard. These must have double action hook gates.



Person climbing with a double lanyard.

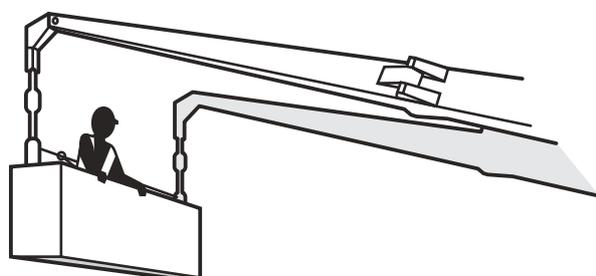
10 Building maintenance units

During the planning stage, consideration should be given to the methods by which maintenance, repairs or cleaning will be undertaken on buildings or structures.

Consideration of future maintenance requirements at the early design stage will avoid the possibility of unsafe work practices occurring during routine maintenance. Sloping building exteriors and decline windows require priority consideration to ensure safe maintenance may be carried out.

A building maintenance unit is a power-operated suspended working platform that is fixed permanently to a building or structure. It is used for access for building maintenance or window cleaning.

Both the design of the building maintenance unit and the actual unit must be registered with WorkSafe.



An example of a building maintenance unit with safety harness and restraint line.

Building maintenance units checklist

The safety considerations include:

- the platform must have sufficient, clearly designated safety harness anchorage points designed to withstand the forces caused by a fall of any person located anywhere on the platform
- building maintenance units should be operated by trained and competent operators
- AS 1418.13 *Cranes (including hoists and winches) – Building maintenance units* and AS 2550.13 *Cranes – Safe use – Building maintenance units* should be consulted for guidance on design and safe use.

Refer to AS/NZS 1891.4 for guidance on fall protection on moveable platforms.

11 Other types of temporary working platforms

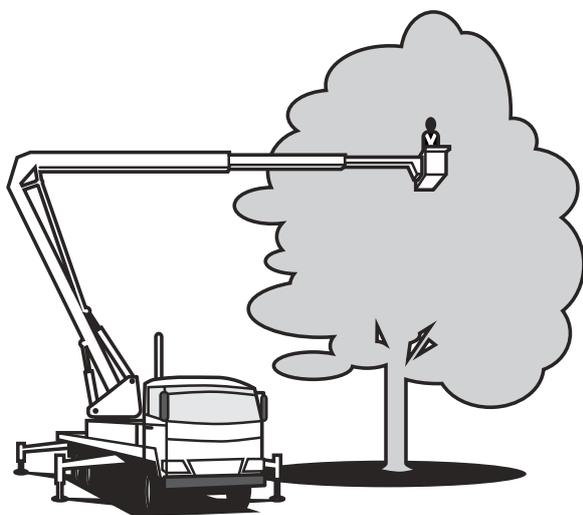
Depending on the situation, other types of working platforms can be considered. These include elevating work platforms (e.g. mobile elevating work platforms, scissor lifts and order pickers), personnel carrying devices (e.g. work boxes), bosun's chairs, light duty suspended stages (e.g. swing stages) and false cars (i.e. platforms used for work in lifts before lift cars are installed).

For an example of a bosun's chair, see the descender in the diagram in Section 17.

Where these devices are being used, ensure signage is used to warn people of work above.

Elevating work platforms

Elevating work platforms (EWPs) are available in a wide variety of types and sizes. They include scissor lifts and boom type elevating platforms or mobile elevating work platforms (MEWPs), as depicted in the diagram below. Some are only designed for hard and flat surfaces, while others are designed for operation on rough terrain.



An example of a MEWP with a safety harness and lanyard assembly. The lanyard should be as short as possible and must be attached directly to the designated anchor point, not attached to the handrail.

The person in charge of the workplace must ensure that the elevating work platform is maintained, inspected and operated:

- in accordance with the manufacturer or designer's written instructions
- if it is not practicable to obtain those instructions, in accordance with written instructions approved by the WorkSafe Western Australia Commissioner

- if it is not practicable to do either of the above, in accordance with AS 2550 series or AS 1418 series. However, there are exclusions for certain types of elevating work platforms (refer to regulation 4.54(4) for more details).

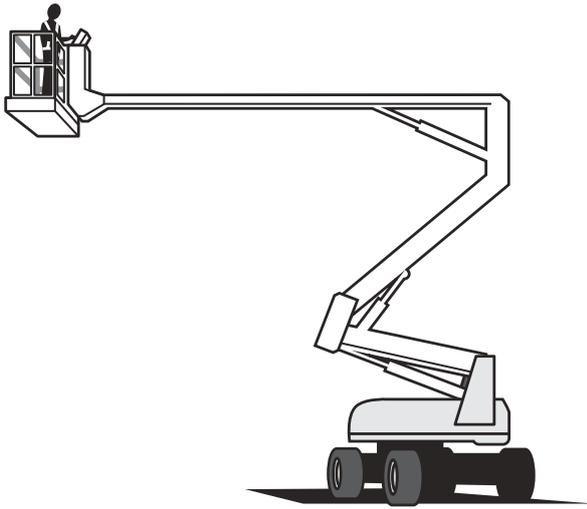
The Australian Standards applicable to elevating work platforms are AS 2550.1 *Cranes, hoists and winches – Safe use – General requirements* and parts of AS 2550.10 *Cranes – Safe use – Mobile elevating work platforms*.

Refer to AS 1418.1 *Cranes, hoists and winches – General requirements* and parts of and AS 1418.10 *Cranes (Including hoists and winches) – Mobile elevating work platforms* for additional guidance.

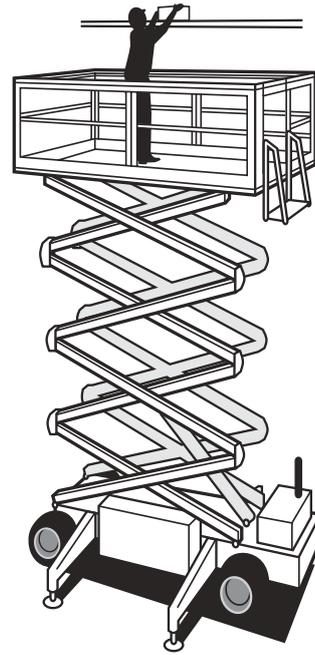
Elevating work platforms checklist

The safety requirements include:

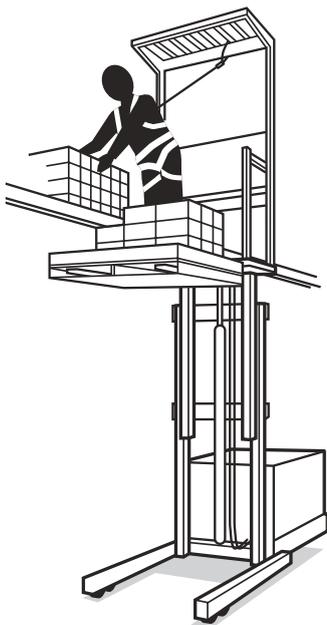
- workers operating the platforms must be trained and instructed in safe operating procedures for the particular brand and type of equipment
- the platforms should only be used as working platforms not as a means of access to and egress from a work area
- unless designed for rough terrain, the platforms should be used only on a solid level surface
- the surface area should be checked to make sure that there are no penetrations or obstructions which could cause uncontrolled movement or overturning of the platform
- when designed as rough terrain platforms, the manufacturer's instructions must be consulted for information on safe operation
- the training provided should include safe use of the fall arrest equipment and emergency rescue procedures
- people working in MEWPs must wear an anchored safety harness and lanyard incorporating a shock absorber as precaution against mechanical failure of the basket. The lanyard should be as short as possible. Fall arrest systems are not required to be worn on scissor lift type elevating work platforms
- people operating MEWPs with boom lengths exceeding 11 metres must have a current licence to perform high risk work.



An example of a boom arm platform with safety harness and lanyard assembly. The lanyard should be as short as possible and must be attached directly to the designated anchor point, not attached to the handrail. People must not climb into or out of the bucket when it is an elevated position – it is a working platform, not a means of access and egress.



An example of a scissor lift elevating work platform. A fall injury prevention system is not required on this item of plant, unless advised by manufacturer or person in control of the workplace and a suitable anchor point is provided.



An example of an order picker using a safety harness and restraint line (lanyard).

Work boxes

A work box is a personnel carrying device designed to be suspended from a crane for the purpose of providing a working area for persons elevated by and working from the box.

Work boxes on cranes checklist

Safety requirements and considerations include:

- other working platforms, such as an elevating working platform or scaffold, are used as an alternative to the work box, if they are practical
- the work box should not be suspended over persons
- a suitable and adequate work box, designed for the purpose, is used and securely attached to the crane. The work box design must be registered with WorkSafe. The workbox, lifting attachments and records should be checked by a competent person before use
- the work box is fitted with a suitable anchorage capable of withstanding the fall forces specified in AS/NZS 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance*. Workers must be attached to the anchorage by a lanyard and harness unless the workbox is fully enclosed

- workers should not enter or leave the workbox when it is elevated unless a risk assessment is conducted (except in an emergency)
- the crane is fitted with the means to safely lower it in an emergency or a power supply failure
- the crane is suitably stabilized at all times while the work box is used
- the crane has 'drive up' and 'drive-down' controls on both the hoisting and luffing motions and those controls are used. No declutching allowing free fall to be used while a workbox is in use
- an effective means of communication, between any person in the work box and the operator, is provided
- the crane is fitted with a safety hook and moused accordingly
- the operator remains at the controls of the crane at all times.

Regulation 4.53 and AS 2550.1 and AS 1418.17 *Cranes (including hoists and winches) – Design and construction of workboxes* and should be consulted for more requirements. Refer to AS/NZS 1891.4 for additional guidance.

Light duty suspended stage (i.e. swing stages)

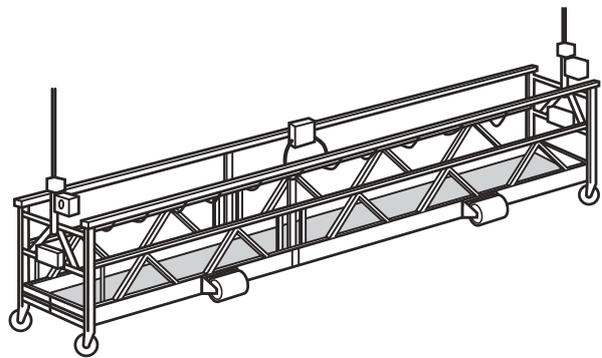
Light duty suspended stage checklist

The safety considerations include:

- specifications and working load should be in accordance with AS 1576.4 *Scaffolding – Suspended scaffolding*
- the design should take into account wind load created by covers and screening etc., and the need for overhead and side protection for the occupants
- the suspension and secondary rope should be:
 - terminated at the rig end with a thimble eye splice or ferrule secured eye termination or other rope coupling device that does not damage the rope and gives a strength of not less than 80 per cent of the breaking load of the rope
 - a rope clamping device should be fitted to the tail end of the rope (where appropriate)
 - the rope should be long enough so that the system will not run out of rope. It should extend one metre beyond the motor in the fully extended position

- the secondary rope should be attached independently to the suspension rig and have the strength of not less than the relevant suspension rope

- edge protection (top rail, mid rail and toe board or top rail, mesh panel and toe board) complies with regulation 3.55(5)
- people installing or servicing a light duty suspended stage should hold a current licence to perform high risk work as per Part 6 of the Regulations. Persons operating light duty suspended stages must be trained in safe operation
- safety harness and restraint lanyard, attached to an independent anchored life line, should be worn by any person working in a swing stage suspended with one wire rope to each winch
- where the swing stage is suspended by two wire ropes to each winch, a safety harness and restraint lanyard should be attached to a suitable anchor point of the swing stage
- the maintenance should be in accordance with the manufacturer's specifications and performed by a competent person
- refer to AS/NZS 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance* for guidance on fall protection on moveable platforms.



Example of a light duty suspended stage with two wire ropes to each winch. A vertical lifeline should be used. It must be ensured that the platform remains horizontal, when moving it up or down.

False cars

False cars are platforms used for work in lifts before lift cars are installed.

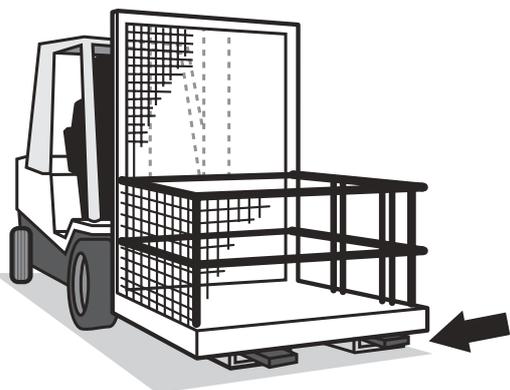
False cars checklist

Safety considerations include:

- if lanyard assemblies are used on false cars, they should be as short as practicable and not connected to guard rails
- these should have edge protection according to regulation 3.55(5)
- a purpose made anchorage designed to withstand the force applied to it as a result of a person's fall should be attached to a suitable area of the false car. Refer to *AS/NZS 1891.4 Industrial fall arrest systems and devices – Selection, use and maintenance* for guidance. AS/NZS 1891.4 requires anchor points for safety harnesses to withstand a force of 15 kN (approximately equivalent to 1,500kg).

12 Forklift trucks

Forklifts fitted with personnel carrying devices (i.e. mancages or work boxes) provide a safe means of raising personnel and equipment to an elevated work area, when they are correctly attached to the forklift carriage and engineer-designed and constructed in accordance with AS 2359 series *Powered industrial trucks*.



An example of an engineer-designed personnel carrying device, with safety harness and lanyard assembly, correctly positioned on the forklift tynes.



Personnel **must not** be raised or carried on forklift tynes. Using a forklift as a working platform or to gain extra height is an unacceptable practice unless a proper personnel carrying device (workbox) is used.



Unacceptable practice with ladder on forklift.

13 Protection of holes and openings

All holes and openings (other than a lift well, stairwell or vehicle inspection pit) with dimensions greater than 200 mm x 200 mm, but less than 2 metres x 2 metres or with a diameter greater than 200 mm, but less than 2 metres, must be protected.

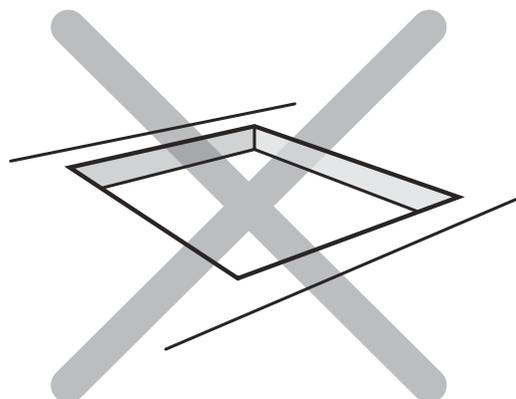
Holes or openings in concrete floors must, where practicable, be protected with embedded wire mesh and covered with material of adequate strength to prevent persons or things entering or falling through.

Holes or openings in any other type of (non-concrete) floor must be covered with material of adequate strength to prevent entry by objects or persons and be fixed securely to the floor.

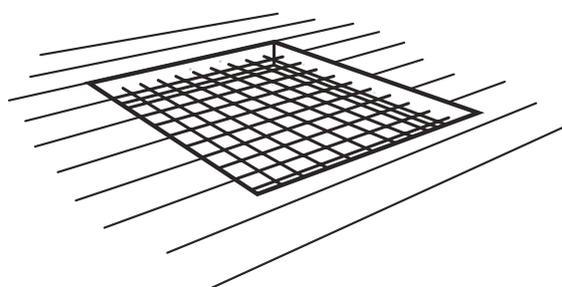
The suitability of polystyrene as a material of adequate strength in any particular situation must be considered carefully prior to use. For example, if scissor lifts are to be used on the floor, the polystyrene will be incapable of supporting the load and could collapse. Petrol and many solvents often used on construction sites will dissolve polystyrene.

Holes or openings covered with wire mesh must not be used as a work platform. When installing services, only the part of the wire mesh that allows access for installation can be removed. The cover should be modified to fit around the installed service.

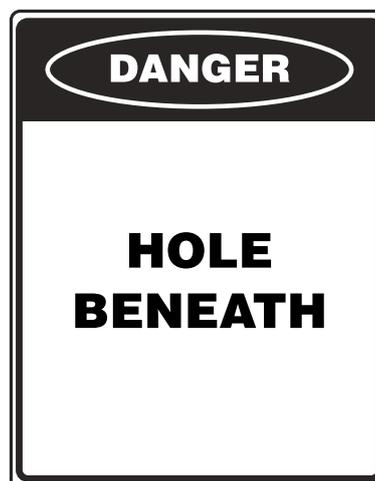
All covers must be fixed securely and marked clearly with the words 'Danger – hole beneath'.



Unprotected holes are a severe hazard and must be covered.



4 mm mesh embedded in the concrete floor. The hole must also be covered to prevent things falling through. There are requirements for wire mesh in regulation 3.54(2).



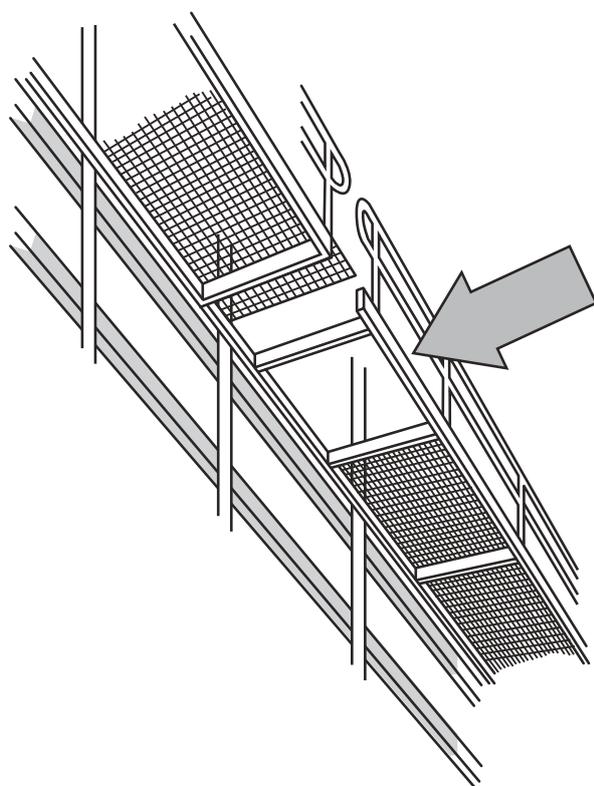
Sign to be affixed to the hole cover.

14 Grid mesh and checker plate flooring panels

Grid mesh and checker plate flooring is used for walkways, access ways and working platforms.

The hazards associated with this type of flooring are:

- panels are easy to dislodge if not fixed securely
- missing grid mesh panels are a severe hazard and, consequently, access to areas with missing panels, except for repair work, must be denied
- if multiple levels are used, a person working on one level can become disoriented.



Missing grid mesh panels are a severe hazard.

Grid mesh and checker plate flooring panels checklist

The safety considerations include:

- flooring panels must be securely fixed and assembled in accordance with manufacturer's specifications
- where possible, they should be fitted to the structure, prior to it being lifted into permanent position
- each panel must be fixed securely before the next panel is placed in position
- during installation, this type of flooring should be secured by tack welding, panel grips or other means to prevent movement before being fixed permanently
- if panels of grid mesh or checker plate flooring are removed, and there is a risk of falling more than three metres, edge protection must be provided. Dimensions of the removed panels may result in openings or holes and these must be protected in accordance with regulation 3.54.

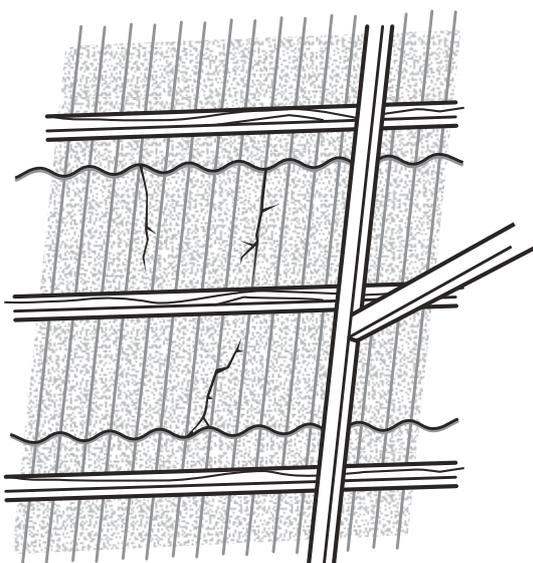
See regulation 3.56 and Section 13. Protection of holes and openings.

15 Brittle or fragile roofing

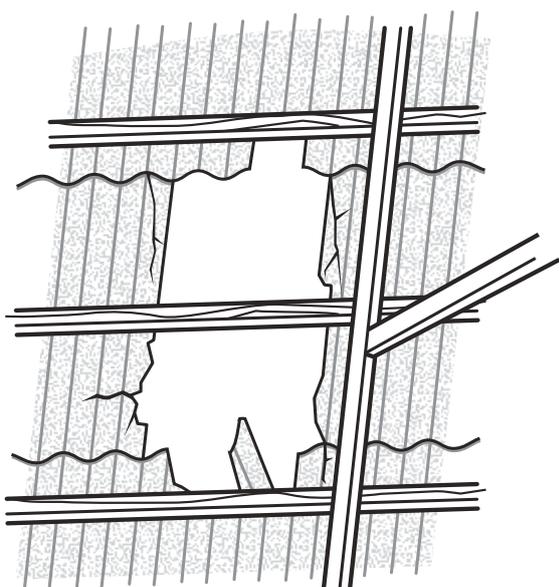
Brittle or fragile roofing materials include roofing made of asbestos, cellulose cement roof sheets, glass, fibreglass, acrylic or other similar synthetic moulded or fabricated material used to sheath a roof or in a roof, which are likely to endanger a person standing on them.

Box gutters made of asbestos cement products, skylights in old buildings and corroded sheet metal roofing are further examples of brittle or fragile roofing.

No-one should walk directly on fragile material.



Severe deterioration of roofing materials may not be severe hazard. Many old roofs readily apparent from the upper surface. Inspect the underside of brittle roofing materials for hazards.



Broken sheets are a severe hazard. Many old roofs have no wire mesh under brittle sheets.



Danger signs to be fixed at points of access to the roof.

Work on brittle or fragile roofing materials checklist

If a person is required to work on or from a roof of material that can break, easily snap or shatter or is weak or perishable, the employer, or the person who has control of the workplace must ensure:

- the person is informed that there is fragile or brittle roofing
- safe access to the work area is provided, as set out in Section 6 of this code, to enable employees to step directly onto a safe platform or area
- work is carried out from a safe working platform that is located and constructed to allow work to be performed safely
- an adequate fall injury prevention system is installed and used
- there is another person present at all times when work is being performed on a brittle roof in case there is an emergency
- training and instruction is provided on precautions to be taken and safe access
- training in rescue techniques has been provided and rescue equipment is readily available for use at the workplace
- warning signs are displayed at access points to any work area where fragile material is present
- warning signs are fixed securely in a position where they will be clearly visible to persons accessing the working area

- before the roof is removed, the brittle or fragile areas are identified and the stability of the structure and soundness of the roof is assessed as part of the risk management process.

See regulation 3.57 and, for risk management obligations, see regulation 3.49.

Maintenance and repairs

Where it is necessary for maintenance or repairs to be carried out on an area containing fragile materials, the employer of those persons should:

- inspect the underside of the work area to determine the extent of fragile material, presence of safety mesh and the structural soundness of the work area and the safety mesh
- provide temporary walkways of at least 450 mm width with edge protection as a means of access to and egress from any work area, where permanent walkways are not provided
- provide timber cleats on temporary walkways where the slope of a walkway exceeds 7 degrees or one vertical to eight horizontal. Timber cleats of 50 mm (width) x 25 mm (thickness) should be fixed to the top side of the walkway planks at distances of 450 mm along the walkway. The walkway should be secured adequately
- provide temporary roof ladders or crawl boards of sufficient strength, where any person is required to carry out work on or adjacent to any part of a sloping roof sheathed in fragile material
- provide individual fall arrest systems and devices for any person required to work on or adjacent to any fragile material, when safety mesh, safety nets or similar fall protection have not been provided. Safety harnesses should be attached by an individual fall arrest device to a static line positioned above the ridge line or an individual anchorage point
- provide training and instruction in the correct use of fall protection and ensure that employees understand the information.

Where the work involves removal of a considerable amount of fragile material, fall arrest systems and devices should be worn by **all personnel** engaged in the work, if the perimeter of the roof is not guarded by a solid balustrade, scaffolding or a guard rail that extends not less than 900 mm or more than 1,100 mm above the roof level at the perimeter and includes a mid rail and toe board.

16 Freight transport and general plant

Generally, the hazards from falls from freight transport and general plant are encountered during either:

- access to and egress from vehicles and plant
- loading and unloading work, including positioning loads, securing freight, moving tarpaulins and minor maintenance work.

The risks include:

- a fall from the top of the load
- a fall when climbing on or off vehicles, trays or gates, etc.
- impact injuries from jumping down from the load or equipment
- a fall or slip due to poor lighting
- a fall when climbing up the outside or on top of a stock crate
- a fall or slip due to loading on uneven ground
- a fall while accessing the top of rail cars because of the heights involved.

Severe injuries have also resulted from workers stepping off moving vehicles, such as rubbish removal trucks carrying out kerbside rubbish collection, instead of waiting for the vehicle to come to a stop. This is an unacceptable practice.

Large trucks

Serious injuries may result from falls from large trucks, such as milk tankers and petrol tankers while, for example:

- accessing or opening tank hatches
- accessing the top of freight containers on road transporters
- fitting 'hungry boards' to increase grain storage capacity or using vacuum loaders on grain transporters.

Plant

Fall injuries may occur during access to and egress from large items of plant, such as farm machinery, large vehicles and earthworks equipment (e.g. bulldozers, scrapers, graders and excavators) and heavy equipment, including during manufacture, maintenance and cleaning.

Safe systems of work

Employers must provide safe systems of work so that, as far as practicable, employees are not exposed to hazards. Employers must also provide employees with information, instruction and training so that they can carry out their work in such a manner that they are not exposed to hazards.

Where people are required to gain access to high areas of trucks, road transporters, tankers or rail cars for purposes of securing, restraining, loading or unloading freight, and there is a risk of falling, employers must provide a safe system of work for them to get to and from the work area.

Using the preferred order of risk control measures, the risks of falls may be eliminated or reduced by implementing the following control measures:

- elimination of hazards is the preferred control measure wherever practicable; e.g. as much work as possible should be carried out from ground level
- substitution by replacing a hazard or hazardous work practice with a less hazardous one is the next preferred control measure; e.g. implementation of safe load restraining methods
- if the hazard cannot be eliminated, substituted or isolated, engineering controls should be introduced, with consideration given to providing safe access to and egress from farm machinery, trucks and heavy plant and equipment, such as steps, permanent access ladders, walkways, loading gantries, guard rails and slip resistance surfaces or coatings that render the surface trip or slip free. Wherever practicable, access and egress should be located to ensure egress does not entail a 'backward drop' by the operator from the last step to the ground
- administrative controls are the least preferred control measures. They include providing information, instruction, training and a safe system of work for preventing falls, supervising workers who are required to work at heights and monitoring the risks to ensure they remain as low as possible.

In some instances, a combination of control measures may be appropriate.

See the table on preferred order of control measures in Section 2.4.

Loading and unloading facilities and equipment

Employers must also give consideration to the equipment and facilities available at both the initial loading point and unloading destination to ensure safe access and egress is provided to workers involved in the operation.

Weather conditions and night work

The safe system of work must be designed to prevent falls from all identified hazards in the work operation, including wet, windy and slippery conditions and work at night when lighting may be poor.

Farm machinery

The provision of seating for passengers in farm machinery is important to prevent falls from equipment, especially when traversing uneven ground. Using the cab window to lean against for support will not be sufficient to prevent a fall under uneven ground conditions. Consideration should also be given to the servicing and maintenance requirements of the machinery to ensure there is safe access and egress.

Tarpaulins

A safe method for placing tarpaulins on large road transport vehicles, with the use of a forklift truck is shown on the following pages. This method avoids the need for personnel to access the top of the truck. Other methods might include installing large permanent ramps from which personnel work at each side of the truck at the loading bay or the provision of purpose designed gantries.

Vehicle cabs

For safer access to and egress from the cab, operators should:

- climb in and out of the cab and not jump down from the cab
- always maintain three points of contact when climbing

See the diagram in Chapter 9 showing a person maintaining three points of contact when climbing.

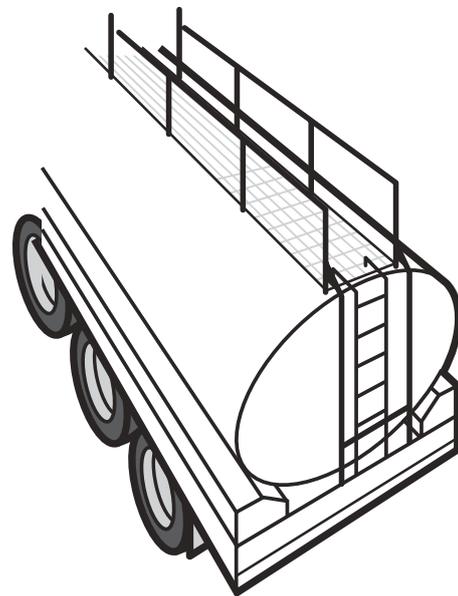
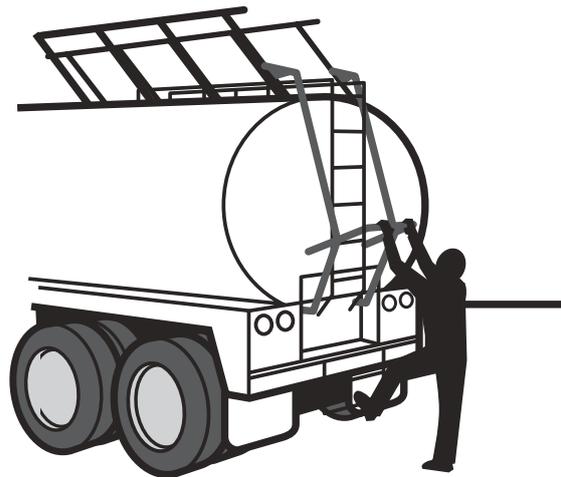
Confined spaces

The Regulations have specific requirements for the entry into confined spaces and compliance with AS 2865 *Confined spaces*. AS 2865 provides guidance in eliminating or minimising the need to enter a confined space and in avoiding exposure to hazards that may be experienced where entry to a confined space is necessary.

Specific emergency rescue procedures will be required when persons are required to work in confined spaces. First aid facilities must be available.

Examples of where hazardous access and egress have been overcome.

Tankers



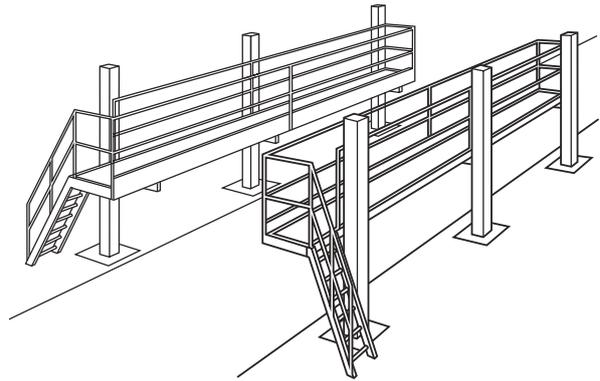
Tanker showing fold down handrails. Midrail and toe board are not shown for clarity of diagram.

Road transporters



Road transporter with freight container. Arrows indicate steps and hand hold positions.

Sheeting vehicles



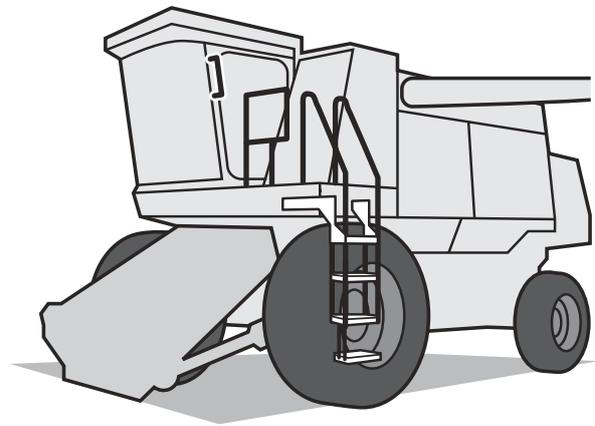
Sheeting gantry providing safe access for sheeting vehicles.

Dump trucks



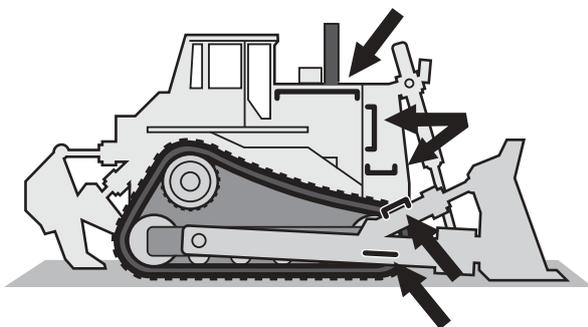
Large rear dump truck.

Harvesters



Farm header with steps. Consideration should be given during a risk assessment to the safety requirements for maintenance and cleaning of harvesters, including cleaning of windscreens.

Bulldozers



Large bulldozer with arrows indicating steps and hand hold positions. Consideration should be given during a risk assessment to the safety requirements when doing maintenance and cleaning.

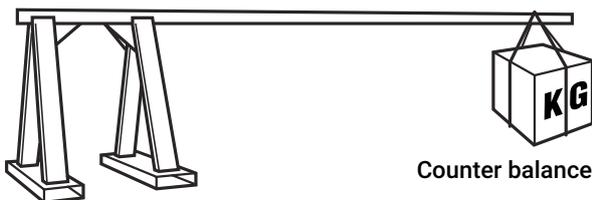
Tarpaulins



Safe method of erecting or removing tarpaulins over high loads on trucks using a purpose designed device attached to a forklift truck. Tying off is carried out from the ground. Personnel do not need to access the top of the truck.



Unsafe method of erecting tarpaulins. Personnel at risk of falling.



Stability of the forklifts, including the effect of high winds, may require incorporation of a counterbalance to the device (as shown in the diagram) or to the forklift itself.

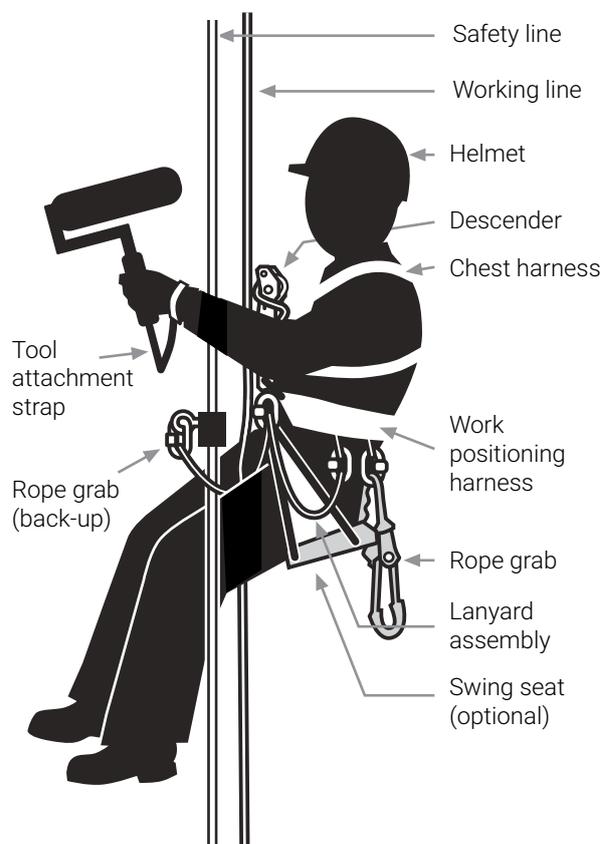
17 Industrial rope access systems (abseiling)

Industrial rope access systems are used for gaining access to a work face, usually by means of vertical suspended ropes. Other methods of accessing a work face should be considered as these systems require skill and can be dangerous. Elevating work platforms and building maintenance units are a preferable means of accessing a work face.

Industrial rope access systems checklist

Where it is necessary for industrial rope access systems to be used:

- personnel must receive training and instruction in the technique and be competent
- operators must be adequately supervised
- operators should not work alone, in case they require assistance in an emergency
- industrial rope access systems should be installed only in a location where it is possible to provide prompt assistance or rescue if required (see also Section 19 Emergency Rescue Procedures)
- all equipment must be checked regularly by a competent person
- prior to use, all fixed anchorage points must be checked by a competent person before attaching the rope access lines
- a back up system must be used to protect the operator
- two independently anchored ropes must be used for each person
- any person within three metres of an unguarded edge must be adequately secured
- all operators should wear a full body harness
- supervisors must ensure communication between personnel is sufficient for the task
- procedures must be clearly understood by the operator
- appropriate personal protective equipment must be used, such as helmets, gloves, hearing protection, goggles and masks
- barricades and signposts should be placed on all access areas below the working area and anchorage locations to exclude and alert the public and tradespeople.



Operator using descender in an industrial rope access system. Where the task requires it, appropriate personal protective equipment must also be used, such as gloves, hearing protection, goggles and mask.

Refer to AS/NZS 4488 *Industrial rope access systems series* for guidance on competencies, training, checklists and specifications.

18 Tree climbing

Tree climbing for tree pruning and trimming may present hazards, which will require specific training and careful planning of activities. There are certain basic requirements concerning equipment and method of operation which must be followed by personnel involved in climbing trees for the purpose of pruning and trimming.

Climbing ropes and safety harnesses should be used. Accidents in tree pruning and trimming operations should not occur if appropriate equipment is used.

Consideration should be given to the use of the following equipment:

- the correct type of harness, e.g. a sit harness with leg straps
- a pole strap with steel core
- a Kernmantle climbing rope
- double or triple action lockable karabiners
- eye and ear protection
- steel cap boots
- climbing spikes
- safety helmet
- tool strap for chainsaw.

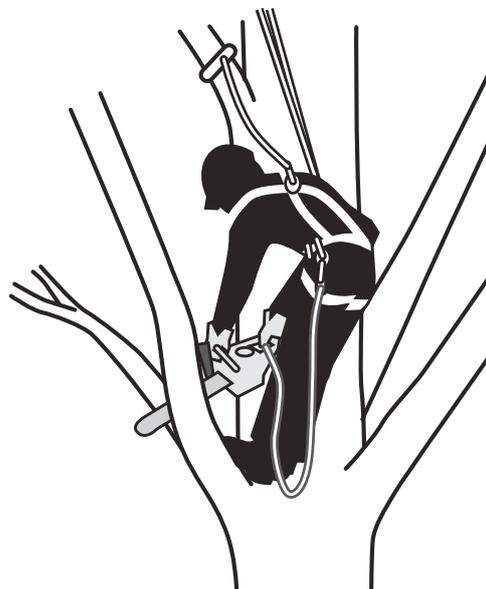
For equipment to use to prevent or arrest falls, refer to the AS/NZS 1891 series.

Chainsaws

Care must be taken when using chainsaws in trees. Chainsaws must be attached to a lanyard of sufficient length to allow the chainsaw to drop below the climber's feet. Chainsaws must be of an appropriate size and in good operating condition. Chainsaws must be turned off when not being used.

Climbing rope

Climbing ropes should be of synthetic fibre (such as a Kernmantle rope) with a minimum diameter of 11 mm, of three strand or braided construction and be durable under conditions of friction and heat. Climbing ropes must have a minimum breaking strength of 10 times the combined weight of the climber and equipment.



When using a chainsaw in a tree, it should be attached to a lanyard that will allow the saw to drop below the climber's feet.

Tree climbing checklist

Safety considerations include:

- inspection of ropes, harnesses, lanyard and equipment prior to use
- another person to be in attendance on the ground
- wearing of appropriate personal protective clothing and equipment
- climber is always attached to tree by climbing rope or pole strap
- pole straps with steel cores should be used with a safety harness for additional security
- climbing rope under tension as far as practicable
- work with climbing rope as vertical as practicable and anchor point located so climber will swing away from any hazard
- climbing rope to be of sufficient length to enable climber to descend to ground
- care must be taken to ensure rope lines are attached to substantial limbs, free from rot or decay, and sufficient to take the worker's weight. The climber should always tie in around the parent limb or trunk and over the lateral limb. Personnel should not rely on the strength of the tree or limb to support their weight without careful consideration of the tree's capacity and integrity

- when ascending large trees, it may be necessary to reset the climbing line several times, often requiring the climbing line to be set in a crotch of the tree well above the climber's head. One way to reset the climbing line is to throw the rope over the limb. Training should include a range of methods for resetting climbing lines
- consider using a supporting structure, such as an elevating work platform, for activities such as pruning and trimming (however, site access difficulties and tree configuration will often make the use of work platforms impracticable, necessitating tree climbing)
- where a boom-type elevating work platform is used, all personnel working from the platform must wear a safety harness and fall arrest lanyard connected to a sufficient anchor point
- use of a stepladder to access the lower portion of a tree and free climbing to higher levels should not be permitted.

Electrical safety

The dangers of electricity must be considered prior to any work being carried out in the vicinity of power lines, whether it is from an elevating work platform or when using climbing ropes and safety harnesses.

The electrical safety requirements include:

- ground crews must always remain alert to any possible dangers from electric wires to personnel working at heights
- persons carrying out or assisting in vegetation control work near power lines must be trained to carry out this work according to the Department's *Code of Practice for Personnel Electrical Safety for Vegetation Control Work Near Live Power Lines*
- untrained personnel must never work above power lines or cut branches which can swing down, fall or come in contact with live power lines
- metal ladders must never be used for tree climbing near electric wires.

19 Emergency rescue procedures

Appropriate rescue procedures must be in place for the rescue of a person in an emergency situation. Employees must be provided with:

- information on emergency rescue procedures
- procedures in the event of different emergencies such as rescues, accidents or injuries
- an induction on the emergency rescue procedures
- training in the emergency rescue procedures
- training in the use of fall arrest systems (where used).

First aid facilities

Employees must be provided with first aid facilities and first aid training for those who may be required to provide first aid.

The Commission for Occupational Safety and Health's code of practice, Codes of Practice First Aid Facilities and Services, Workplace Amenities and Facilities, Personal Protective Clothing and Equipment should be consulted for guidance on the legislative requirements for first aid facilities and workplace amenities.

Refer to Safe Work Australia, *Managing the risk of falls at workplaces Code of Practice*, section 10 (October 2018) for additional guidance.

19.1 Fall arrest systems

Emergency rescue procedures for fall arrest systems

Emergency rescue procedures should be developed before setting up a fall arrest or industrial rope access system. Procedures should take into account the need for:

- a plan and timeframe to carry out any rescues
- the immediate rescue of a person after an arrested fall, without the need to rely on emergency services. See the following section for information on suspension trauma, which can occur when a person is suspended in a harness
- the necessary equipment required to carry out a rescue. This should include an emergency rapid response kit with synthetic fibre rope (see AS 4142.3 *Fibre ropes – Man-made fibre ropes for static life rescue line specifications* and AS/NZS 4488.2 *Industrial rope access systems – Selection, use and maintenance for auto-stop descent devices*)

- the installation of individual fall arrest systems and individual rope access systems in locations where it is possible to assist or rescue a person quickly if required
- ensuring that all workers who will be working with the fall injury prevention system receive information, instruction and training in emergency rescue processes and are familiar with fall arrest systems and devices, prior to work commencing
- ensuring that any persons using a fall arrest system or industrial rope access are not working alone. This is important if there is a risk of a fall
- the availability of and access to first aid facilities or services, including trained first aiders. The rescue team should include a person or people trained in the provision of first aid so that it can be administered to the fall victim in the event of an injury occurring during a fall
- the details of additional support facilities, including the location, contact information and availability (hours open) of emergency services, such as fire brigade, ambulance and hospitals
- an effective and readily available means of communication.

19.1.1 Suspension trauma

'Suspension trauma' can occur when a person's legs are immobile in an upright posture for a prolonged period because the lower legs have a large storage capacity for blood and gravity pulls blood into them. The return blood flow to the heart is reduced as blood accumulates in the legs. Because the blood supply to the heart is then restricted, the body suddenly slows the heart causing the person to faint.

With the use of a fall arrest system, suspension trauma may occur when a person has an arrested fall because they are suspended and caught in an upright, vertical position and the harness straps cause pressure on the leg veins. The blood flow to the heart is reduced, resulting in fainting, restriction of movement or loss of consciousness in a few minutes. This may lead to renal failure and eventually death, depending on a person's susceptibility. The condition may be worsened by heat and dehydration.

Susceptibility to suspension trauma may be unrelated to fitness level or any other obvious physical conditions. Therefore, the quick rescue of a person suspended in a full body harness, as soon as is possible, is vital. For this reason, workers should be capable of conducting a rescue of a fallen worker and be familiar with onsite rescue equipment and procedures.

Workers and emergency response personnel must be trained in the rescue procedures and be able to recognise the risks of suspension trauma and act quickly in the rescue of a person.

Refer to Australian Resuscitation Council *Guideline 9.1.5 – Harness Suspension Trauma* (July 2009).

Preventing suspension trauma

Recommendations for preventing suspension trauma as a result of an arrested fall include:

- workers should never work alone when using a harness as fall protection
- workers spending time hanging in a harness should use a sit type harness, which allows legs to be kept horizontal
- the time a worker spends in suspension after a fall should be limited to less than five minutes. When a suspension is longer than five minutes, foothold straps or a way of placing weight on the legs should be provided
- Workers should be trained to do the following when they are hanging in their harness after a fall:
 - try to move the legs in the harness and push against any footholds, where these movements are possible. In some instances, the harness design and/or any injuries received may prevent this movement
 - try to move the legs as high as possible and the head as horizontal as possible, where these movements are possible. These movements are not possible in some of the harnesses available. This factor should be considered when selecting a harness for use at the workplace
- harnesses should be selected for specific applications, with consideration given to comfort, potential injuries and suspension trauma.

Training for rescues

The training for rescues of persons who have fallen and are suspended in an upright position should address the following factors to prevent suspension trauma:

- the rescue process should be quick to start because a suspension in an upright position for longer than five minutes has the potential to cause death
- the victim should be moved from suspension in stages; i.e. the procedure should take 30-40 minutes with the victim moved first into a kneeling position, then into a sitting position, and finally into a horizontal position. The victim should not be moved too quickly into a horizontal position because this can kill them.

Appendix 1 References

Legislation

Occupational Safety and Health Act 1984

www.legislation.wa.gov.au/legislation/statutes.nsf/law_a555.html

Occupational Safety and Health Regulations 1996

www.legislation.wa.gov.au/legislation/statutes.nsf/law_s4665.html

Standards

Australian Standards and Australian/New Zealand Standards

AS 1418.1	Cranes, hoists and winches – General requirements
AS 1418.10	Cranes (Including hoists and winches) – Mobile elevating work platforms
AS 1418.13	Cranes (including hoists and winches) – Building maintenance units
AS 1418.17	Cranes (including hoists and winches) – Design and construction of workboxes
AS/NZS 1576 series	Scaffolding
AS 1657	Fixed platforms, walkways, stairways and ladders – Design, construction and installation
AS/NZS 1891.1	Industrial fall arrest systems and devices – Harnesses and ancillary equipment
AS/NZS 1891.2 Supp.1	Industrial fall arrest systems and devices – Horizontal lifeline and rail systems – Prescribed configurations for horizontal lifelines
AS/NZS 1891.3	Industrial fall arrest systems and devices – Fall arrest devices
AS/NZS 1891.4	Industrial fall arrest systems and devices – Selection, use and maintenance
AS/NZS 1892.1	Portable Ladders – Performance and geometric requirements

AS/NZS 1892.5	Portable ladders – Selection, safe use and care
AS 2317.1	Lifting points – Collared eyebolts and collared eye nuts – Grade 4
AS 2319	Rigging screws and turnbuckles
AS 2424	Plastics building sheets – General installation requirements and design of roofing systems
AS 2359 series	Powered industrial trucks
AS 2550.1	Cranes, hoists and winches – Safe use – General requirements
AS 2250.10	Cranes, hoists and winches – Safe use – Mobile elevating work platforms
AS 2550.13	Cranes – Safe use – Building maintenance units
AS 2865	Confined spaces
AS 3569	Steel wire ropes – Product specification
AS 4142.3	Fibre ropes – Man-made fibre ropes for static life rescue lines
AS/NZS 4389	Roof safety mesh
AS/NZS 4488.1	Industrial rope access systems – Specifications
AS/NZS 4488.2	Industrial rope access systems – Selection, use and maintenance
AS/NZS 4576	Guidelines for scaffolding

Available from Standards Australia

www.standards.org.au/

British Standards Institution

BS EN 1263-1 *Temporary works equipment – Safety nets – Safety requirements, test methods*

infostore.saiglobal.com/en-au/Standards/BS-EN-1263-1-2014-245879_SAIG_BSI_BSI_572620/

BS EN 1263-2 *Temporary works equipment – Safety Nets – Safety requirements for the positioning limits*

infostore.saiglobal.com/en-au/Standards/BS-EN-1263-2-2014-245886_SAIG_BSI_BSI_572638/

Codes of practice

Commission for Occupational Safety and Health

Code of Practice: Excavation (2005)

www.commerce.wa.gov.au/sites/default/files/atoms/files/code_excavation.pdf

Plant in the Workplace: Making it Safe: a Guide for Employers, Self-Employed Persons and Employees (2001)

www.commerce.wa.gov.au/sites/default/files/atoms/files/guide-plant_hazards.pdf

Plant Design: Making it Safe: a Guide for Designers, Manufacturers, Importers, Suppliers and Installers of Plant (2001)

www.commerce.wa.gov.au/sites/default/files/atoms/files/guide_plant_design.pdf

Codes of Practice: First Aid Facilities and Services; Workplace Amenities and Facilities; Personal Protective Clothing and Equipment should be consulted for guidance on the legislative requirements for first aid facilities and workplace amenities (2002)

www.commerce.wa.gov.au/sites/default/files/atoms/files/code_first_aid_0.pdf

DMIRS

Code of practice for personnel electrical safety for vegetation control work near live power lines (2012)
www.commerce.wa.gov.au/building-and-energy/code-practice-vegetation-worker-electrical-safety

WorkSafe Bulletin – Domestic construction: Controlling falling risks while working on roof structures (2014)
www.commerce.wa.gov.au/sites/default/files/atoms/files/domestic_construction_0.pdf

Safe Work Australia

Managing the risk of falls at workplaces – Code of Practice (October 2018)
www.safeworkaustralia.gov.au/system/files/documents/1810/model-cop-managing-the-risk-of-falls-at-workplaces.pdf

Guidelines

Australian Resuscitation Council

Guideline 9.1.5 – Harness Suspension Trauma (July 2009)
resus.org.au/guidelines/

Appendix 2 Job safety analysis (JSA)

Working with a JSA

Safety management is about reducing the risk of injury or harm for any person who may be affected by the work. This includes employers, contractors, all workers, visitors and members of the public who may be at or near a work site.

The work should be organised so that all of these people can carry out their usual activities safely.

Coordination

A JSA is one way of providing information to everyone involved in a particular task. It sets out the method that will be used and the way that hazards associated with the task will be managed on that site.

JSAs also provide the information that is needed for principal contractors and site supervisors to coordinate the work. They can refer to the JSAs to ensure that everyone is following the steps to be taken to complete the job safely.

Preparing for work

JSAs are an important part of preparing for each job.

JSAs should be completed before work begins.

Each worker involved with the job should know what is in the JSA for the work they are doing.

Taking it step-by-step

Completing a JSA does not have to be a complicated process. It can be as simple as writing a few dot points under each of the headings in the blank JSA form on the next page.

Taking it one step at a time will make the whole process easier. It is best done with the people who usually carry out the tasks because they know the job well and they will have to follow the JSA when it is completed.

Break the job down into steps and record the steps in the Work activity column in the order that they would usually occur on site.

In the Hazard column, list the ways that anyone could be injured or harmed during each step. Think about all workers and any visitors or members of the public that may be affected.

Work out what could be done to make the job safer and prevent the injuries or harm that may occur. Write this in the Risk control column.

In the Persons responsible column, write down the name of the person who has to make sure the risk controls are actually carried out on the site.

Make sure everyone understands that the JSA should be changed if there is a change to the site and different risk controls are required. The JSA should be reviewed and updated regularly.

Training and supervision

A JSA provides a written record of the way a particular task should be done.

The JSA does not replace the information, instruction, training and supervision that are required to ensure the task is done that way.

It is up to the employer/principal contractor to ensure that each person has the skills to work safely and there is adequate supervision of the work underway at each site.

Introducing JSAs

It is a good idea to start with high risk work activities. Gradually the number of situations where JSAs are used will grow and they will become a regular part of managing safety on the site.

Safe work method statements (SWMS)

Section 3.143 of the Regulations requires that all high risk construction work done, or to be done, at the site must be covered by a SWMS. Persons who have day-to-day on-site control of high risk construction work must provide the main contractor with a SWMS or, failing that, the main contractor must prepare the necessary SWMS and keep it up to date.

The main contractor must ensure that high risk construction work, as far as practicable, is carried out in accordance with the SWMS. If work is not carried out in accordance with the SWMS, the work must cease until the SWMS is complied with.

The SWMS must be in writing and, as far as practicable, set out:

- each high risk construction work activity that is or includes a hazard
- the risk of injury or harm to a person resulting from any such hazards
- the safety measures to be implemented to reduce the risk, including the control measures which are genuinely based on the hierarchy of controls
- a description of the equipment to be used in the work activity

- the qualifications and training (if any) required for persons doing the work.

And where required:

- outlines the legislation, standards and codes to be complied with
- includes a description of the equipment used in the work, the qualifications of the personnel doing the work and the training required to do the work in a safe and environmentally sound manner.

Safe Work Method Statement is sometimes called job safety analysis (JSA) or job safety and environment analysis (JSEA).

Job safety analysis example: cleaning gutters

Note: this is only an example and may not address all the hazards for this particular work activity at a specific site. A JSA that is relevant to an individual site should be prepared.

Name of organisation completing the work: ABC Gutters		Job name: Smith's residence			
Task: Cleaning gutters on a single-storey house using a portable ladder		Job number: Project 001			
Principal contractor: ABC Gutters		Job location: Rio Road, Cottesloe			
Date the JSA was prepared: 20/05/20		Number of pages in this JSA: 2			
This JSA has been reviewed by: Joe Bloggs, Site Supervisor		This JSA has been discussed with: Joe Bloggs, Site Supervisor and Jack Brown, Employee			
Principal contractor or representative (signature) J.F. Bloggs		Employee/subcontractor (signature) J.S. Brown			
Position: Supervisor	Date: 20/05/20	Position: Supervisor	Date: 20/05/20		
Item number	Work activity	Hazard	Risk control	Persons responsible	Completion
1.	Break the job down into steps Move ladder from vehicle to location.	What could harm someone? Back injury (twisting and over-reaching). Being hit by oncoming traffic. Hitting other people.	What can be done to make the job safe? Assistance by another person. Plan lift to avoid back injury. Park vehicle in safe area to avoid being hit by oncoming traffic and hitting persons. Keep safe distance from power lines.	Who will make sure it happens? Jack Brown (employee) Joe Bloggs (supervisor)	Date and signoff
2.	Check ladder.	Ladder collapse.	Use industrial type ladder. Ladder conforms with AS/NZS 1892. Inspect ladder for cracks and damage in accordance with the manufacturer's instructions.	Jack Brown (employee) Joe Bloggs (supervisor)	

Item number	Work activity Break the job down into steps	Hazard What could harm someone?	Risk control What can be done to make the job safe?	Persons responsible Who will make sure it happens?	Completion Date and signoff
3.	Set up ladder on gutter.	Power lines nearby. Uneven ground. Sun exposure. Public being hit.	Ensure ladder is not close to electrical danger zone. If needed, use boards or suitable material to ensure a firm footing. Use sun protection. Bunt the area around ladder to isolate the public. Set up ladder at 1/4 distance from the height of the gutter (i.e. if the gutter is four metres high, the foot of the ladder should be one metre away from the gutter line).	Jack Brown (employee) Joe Bloggs (supervisor)	
4.	Climb ladder.	Slip, trips and falls off ladder. Ladder slipping or sliding.	Ladder secured at the gutter or have someone else footing the ladder. Three points of contact with the ladder at all times (two feet and one hand). Wear shoes with good, slip resistant soles. Use bag or pouch to carry tools and equipments.	Jack Brown (employee) Joe Bloggs (supervisor)	

Appendix 3 Terms used in fall injury prevention systems

Systems

Active fall protection – is a system where individuals must take action to use equipment either to prevent them entering a fall hazard area or to arrest their fall (e.g. a fall arrest or fall restraint system).

Individual fall arrest systems – are designed to arrest an accidental fall and consist of some or all of the following:

- anchorage
- lifeline
- inertia reel
- lanyard
- retractable lifeline
- rope grabs
- wire grabs
- rail system
- shock absorbers – both personal and industrial
- harness.

Passive fall protection – is a system where the equipment installed provides fall protection, such as the installation of edge protection, safety nets and catch platforms, and individuals using the system do not have to take action to use equipment specifically designed to prevent falls. See also the above definition of active fall protection.

Restraint systems (individual travel restricting systems) – these systems are designed to prevent the user from moving into a fall hazard area and consist of:

- anchorage
- lanyard
- belt or harness
- horizontal lifeline.

Work positioning systems – provide a primary means of support in relative comfort and consist of:

- anchorage
- lifeline (dropline) x 2
- descender
- ascender
- back-up device
- bosun's chair
- harness.

Terms

Anchorage – means an anchorage point for a fall injury prevention system. It is the means for attaching a lanyard, lifeline or other components to a secure point.

Arrest force – is the force imposed upon the worker and the anchorage point, the moment the fall arrest system stops the fall, measured in kilonewtons (kN).

Body containment devices – are designed to contain the body of a falling worker and to distribute forces resulting from an arrested fall to minimise the likelihood of injury. They consist of a full body harness (parachute type) together with associated components such as a lanyard and personal energy absorber. Harnesses can be used for restraint systems and work positioning systems according to relevant sections in AS/NZS 1891.1 *Industrial fall arrest systems and devices: Harnesses and ancillary equipment* and AS/NSZ 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance*.

Droplines – are vertical lifelines.

Double or triple action device – is a self-closing hook or karabiner with a keeper latch which will automatically close and remain closed until manually opened. These units have a minimum of at least two distinct and deliberate consecutive actions to manually open them.

Fall arrest devices – there are three types: Type 1 fall arrest devices, Type 2 and Type 3 fall arrest devices (see definitions on following page).

Fall indicator – is a visual indicator that shows that the fall arrest system or device has been used to arrest a fall.

Fall injury prevention system – means a system designed to arrest a person's fall from one level at a workplace to another and minimise the risk of injury or harm to a person who falls from one level at a workplace to another.

Force – this is measured in technical terms in Newtons (N). The weight of something in Newtons (N) is calculated by multiplying its mass in kilograms (kgs) by the value of gravity, which is 9.81 (m/s²).

Force = Mass X Acceleration

For rough calculation purposes:

1000N=1kN 1kN=100 kg 10kN=1000 kg

Free fall – is any fall or part of a fall where the person suffering the fall is under the unrestrained influence of gravity over any fall distance, either vertically or on a slope on which it is not possible to walk without the assistance of a handrail or hand line. The maximum allowed free fall is two metres.

Inertia reel (also known as a self-retracting lanyard or fall arrest block) – is a mechanical device that arrests a fall by locking onto a dropline and at the same time allows freedom of movement.

Job Safety Analysis (JSA) – these are a means of setting out the ways that hazards associated with a task will be managed on a site and the work methods that will be used. They are usually a standardised form produced by an association, employer or government agency. Refer to Appendix 4.

Karabiners – these are metal types of connectors that can be attached to anchorage points. They come in a variety of sizes, shapes and locking mechanisms to suit various applications and provide the most convenient type of connector as they can be easily attached and detached. They should be self-closing and self- or manual-locking and capable of being opened only by at least two consecutive deliberate manual actions.

Lanyard – is a line usually used as part of a lanyard assembly to connect a harness to an anchorage point or static line in situations where there is risk of a fall.

Lanyard assembly – is an assembly of a lanyard and a personal energy absorber.

Locking traveller (horizontal) – is a travelling anchorage. It has a walking sprocket device that connects the user to a static line system allowing the user to travel the entire length of the line without having to unclip and re-clip when passing the line supports.

Locking traveller (incline) – arrests falls on surfaces up to an angle of 30 degrees.

Personal energy absorber (deceleration device) – this is an attachment designed to reduce the deceleration force imposed by a suddenly arrested fall. A personal energy absorber is designed to be used with a fall arrest harness and lanyard.

Restraint line – is the line securing workers to a point of anchorage and is used to prevent a person from reaching a point from which he or she could fall.

Safety factor – this factor accounts for complex and variable dynamic forces and unknowns, such as rope ageing, metal fatigue, abrasion, bending and structure contact. It can, for example, be used to work out:

- the ratio of the ultimate strength of the material to the permissible stress
- the ratio between the weakest link in the system compared to the maximum expected static load
- the minimum breaking load and the safe working load.

Formulas $SF = \frac{BF}{SWL}$ $SWL = \frac{BF}{SF}$ $BF = SF \times SWL$

(SF IS SAFETY FACTOR, BF IS BREAKING FORCE AND SWL IS SAFE WORKING LOAD)

Static line – is a horizontal or substantially horizontal line to which a lanyard may be attached and which is designed to arrest a free fall.

Total fall distance – is the total distance a person is likely to fall during both the free and restrained parts of a fall and includes the maximum dynamic extension of all supporting components.

Type 1 fall arrest device (includes rope and rail grabs) – this is a fall arrest device that travels along an anchorage line and, when loaded, locks to the line. The user is connected via a short lanyard to the activating lever, which locks the device in the event of a fall. A typical use of a Type 1 device is as a ladder fall arrest system, using a rigid rail or a flexible line attached to the ladder.

Type 2 and Type 3 fall arrest devices (also known as an inertia reel or self-retracting lifeline) – this is a fall arrest device from which a spring loaded anchorage line pays out, and which locks when loaded and releases when the load is removed. When incorporating a retrieval winch, it becomes a Type 3 fall arrest device.

Appendix 4 Components of fall arrest and restraint systems

Key points on components of fall arrest and restraint systems include:

- all components of a fall arrest system must be compatible
- do not 'mix and match' systems with different components made by different manufacturers
- check with the manufacturer and/or supplier to ensure compatibility of components.

See Appendix 3 for definitions of terms and also Section 8.4 Inspection of fall-injury prevention systems.

(i) Cable (in the fixed static safety line)

The safety requirements for the use of the cable include:

- the cable should be of a minimum diameter of 10 mm and provide a minimum safety factor of 10
- the cable should have a guaranteed breaking strain (GBS) of 60 kN (approximately equivalent to six tonne)
- the cable support at each column should be in accordance with an engineer's specification
- consideration should be given to the many variables important in the erection of fixed static lines. These include the:
 - number of people on the system at any one time
 - length of the system
 - length between intermediate supports, length of lanyard of the user and distance below the user.

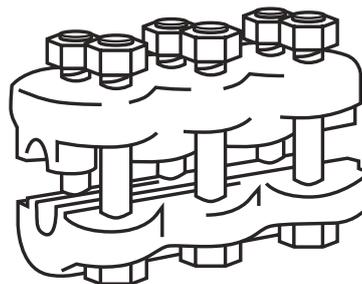
Engineer-designed systems are necessary to consider all these variables:

- industrial shock absorbers should be used to ensure the force generated in simultaneous falls on the safety system will not generate more than 12 kN (approximately equivalent to 1200 kg) at the anchorage points, unless the anchorage points have been designed by an engineer to withstand a greater force
- tensioning of the fixed static line should be achieved by installing turnbuckles or other appropriate means. Where turnbuckles are used, they should be installed as recommended on the following pages
- the cable should be placed to eliminate the risk of tripping. Where practicable, the cable should be located between two metres and 2.2 metres above the floor of the work area.

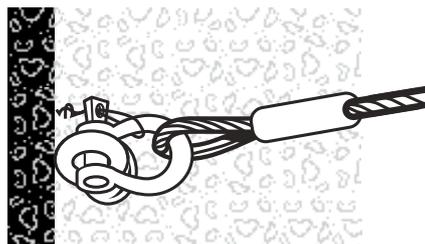
Refer to AS 3569 *Steel wire ropes – Product specification* for further guidance.

(ii) Cable end (termination of the fixed static lines)

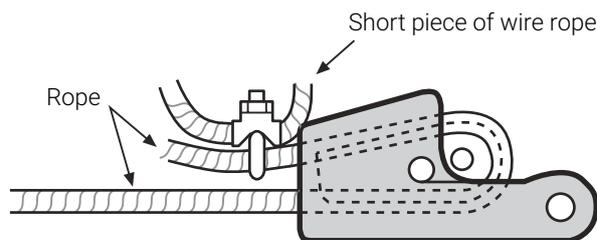
The termination of the cable should be by the installation of a thimble eye. Where practicable, the ends should be secured by one of the means depicted below.



Double base clamps, with a minimum of three installed at equal spaces, with a minimum 200 mm tail past the last clamp.



A hand splice with thimble eye or machine splice with thimble eye.



Wedge sockets.

Note: Cables and fittings may be secured directly to anchorage points with D or bow shackles of a minimum size of 12 mm or by having a safe working load of not less than 20 kN (approximately equivalent to two tonnes). The pin of the shackle should be moused (lashed) to the shackle.

(iii) Anchorage points

Anchorage points are secure points of attachment for the fixed static line and lanyards. The safety requirements for the use of anchorage points include:

- anchorage points used should be located as high as equipment permits, as it is dangerous to work above the point of anchorage
- the diameter of the threaded sections of bolts and their anchorages should not be less than 16 mm (see AS 2317.1 *Lifting points – Collared eyebolts and collared eye nuts – Grade 4* for guidance on specifications)
- all anchorages should be visibly checked prior to use.

The following types of anchorage points are acceptable when used in concrete:

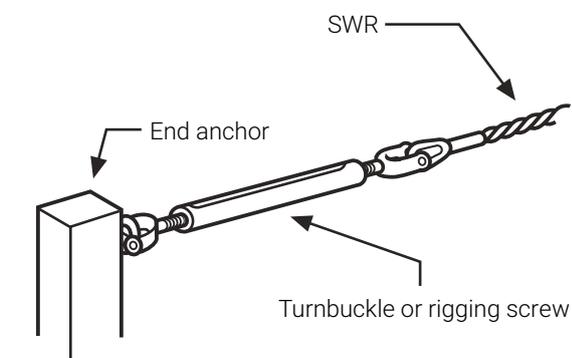
- anchorage points cast in situ:
 - a wall tie (she-bolt) purpose designed
 - an engineer-designed anchorage point
- chemical-type anchorage points incorporating a 16 mm diameter bolt and 110 mm embedment and used in shear
- friction-type anchorage points with a collared eye or eyebolt, used in shear, with the threaded section being no less than 16 mm diameter. The collared eye nut should be fastened tightly against the concrete surface.

Chemical or friction-type anchorages should be used in shear only; i.e. the bolt should be at right angles to the static cable.

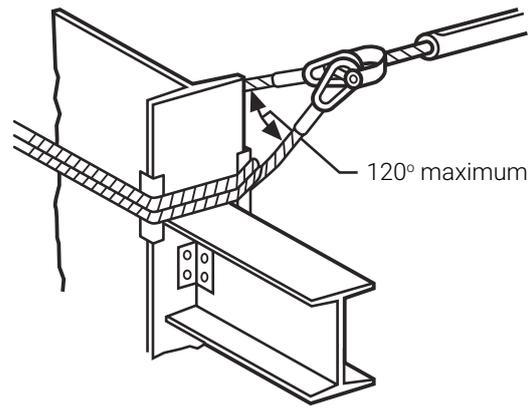
For information on inspection of anchorages, see Section 8.4.

Anchorages should have a design capacity of 15 kN (approximately equivalent to 1500 kg) each, except where verification of a lesser design load provides for a minimum safety factor of 10.

Anchorages must be designed, manufactured, constructed, selected or installed so as to be capable of withstanding the force applied as a result of a person's fall at the workplace anchorage point [regulation 3.50].



Direct connection anchorage.



Sling anchorage.

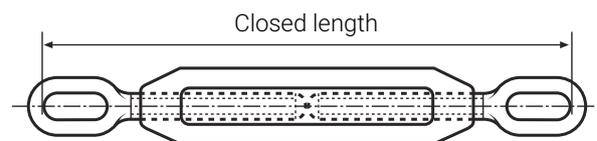
(iv) Turnbuckles (to adjust the tension in the fixed static line)

Turnbuckles are an open body consisting of two integral rods connecting two bosses that are threaded internally on the central axis in opposite hand and into which end fittings of optional with screwed clamps type (e.g. round eye, elongated eye or clevis) are fitted.

The safety requirements for the use of turnbuckles include:

- the threaded section shall be a minimum of 12 mm diameter
- turnbuckles should be of a type that will allow visual inspection of the condition and extension of the threaded sections
- the frame should be locked or moused (lashed) to the eye bolt to prevent slackening due to vibration, shock or spin in the line attached.

Refer to AS 2319 *Rigging screws and turnbuckles* for guidance.



Turnbuckle assembly with elongated eyes.

(v) Temporary static lines (horizontal life line systems)

Temporary static lines are linear anchorages, which allow users of fall arrest equipment the flexibility of lateral movements without having to disconnect from the anchorage.

The safety requirements for the use of temporary static lines include:

- a 16 mm diameter nylon rope of Kernmantle construction which provides a minimum safety factor of 10 may be used. The line must have a guaranteed breaking strain (GBS) of 80 kN (approximately equivalent to eight tonnes). Refer to AS 4142.3 for guidance

- tension may be achieved by using a self-tensioning block, which must be capable of automatically locking the line and manually releasing the line. Too much tension on the line will affect the overall strength of the system, too little will affect the ground clearance required
- for shock absorption, the self-tensioning block must be designed to reduce shock loading by means of a dynamic friction facility which guarantees that the maximum force generated on the line will not be greater than 6 kN (approximately equivalent to 600 kg)
- the line end (termination of the temporary static line) should be secured by one of the following:
 - a hand splice with a thimble eye
 - a machine splice (ferrule)
 - a figure of eight knot
- the maximum span between anchorage points for a temporary static line should be no greater than four metres, unless specifically designed by an engineer to be a longer length. This is due to the dynamic sag factor of the temporary static line and should be taken into account when calculating the maximum ground clearance (MGC) requirement for a fall arrest system
- total fall distance is defined in the AS/NZS 1891.1 *Industrial fall arrest systems and devices: Harnesses and ancillary equipment* as the total distance a person is likely to fall during both the free and restrained parts of a fall and includes the maximum dynamic extension of all supporting components.

Designers of temporary static lines should ensure the system is designed so that persons falling will not crash to the ground. Calculations should consider:

- tension on the static line
- a person's height
- lanyard length and extension
- shock absorber extension
- personal energy absorber of the person's lanyard
- slide of the D ring.

The person's weight will have a significant effect on the sag of the temporary static line. Other factors to be considered include:

- climate (temperature and wet or dry)
- type of knots
- age of the system.

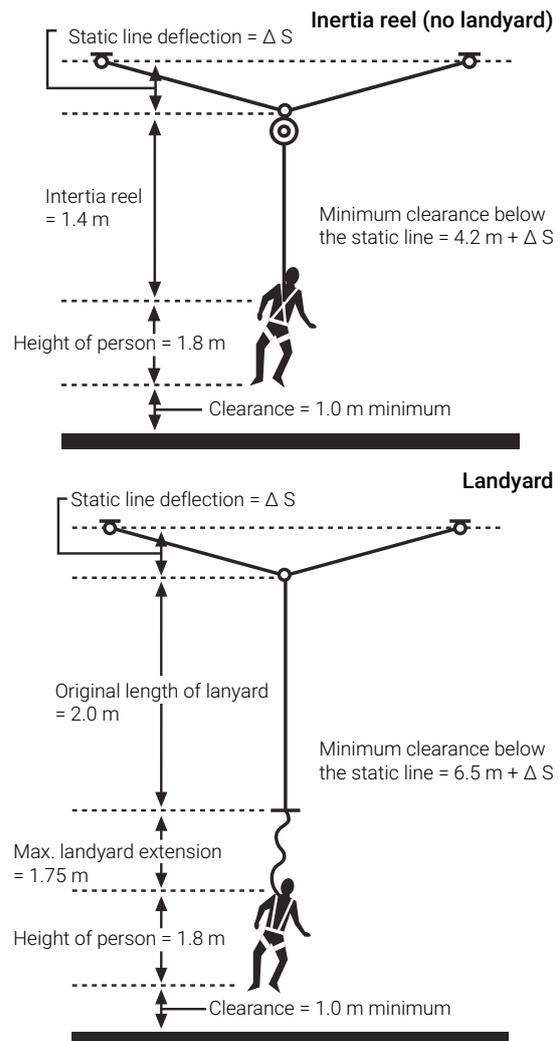
Rail systems

Rail systems are rigid systems which are generally comprised of a steel or other metallic structural member, along which one or more mobile attachment devices run, each providing a travelling anchorage for connection of a personal lanyard assembly on a fall arrest system.

Safety requirements for the use of a temporary static line and rail system include:

- unless there is a ground clearance under the temporary static line of at least 6.5 metres plus the distance of sag in the line under load, the user of fall arrest equipment will probably not have their fall arrested and will strike the ground. (See the diagram on the right below)
- inertia reels (self-retracting lanyards) on temporary static line systems could be used. These will significantly reduce the 6.5 metre ground clearance due to the inertia reel lock-out. (See the diagram on the left below)
- in some circumstances, the ground clearance might be reduced. Using the 'preferred order of control measures', a combination of different equipment (such as a restraint system, elevating work platform and scaffolding) should be considered to give different results and create maximum ground clearance
- personal energy absorbers must be worn at all times where there is a possibility of a fall.

AS/NZS 1891.2 Supp. 1 provides further information.



Required minimum fall clearance below the level of the line anchorage.

(vi) Harnesses, lanyards and equipment

Waist-type belts and sit harnesses must not be used as a fall arrest system.

The lanyard is a line, usually used as part of a lanyard assembly, to connect a fall arrest safety harness to an anchorage point or permanent or temporary static line, in situations where there is a risk of a fall.

The safety requirements for the use of harnesses, lanyards and equipment include:

- body-type harnesses of the parachute-type should be used
- length of any lanyard assembly should not exceed two metres
- harness should be connected to the lanyard or temporary static line at the top dorsal (back) position or front (sternum) fall arrest attachment point
- if a temporary or permanent static line and rope grab device are used on steeply sloping surfaces, the user needs to have the device in the front fall arrest attachment point. This will allow safe manual operation of the mechanism
- lanyards should be checked for the faults listed in the defects and damage to lanyards checklist
- anchorage points shall not be sited below the attachment point of the harness; e.g. not below the dorsal (back) position
- there should be a minimum of slack in the temporary static line between the person and attachment to the anchorage. The fall arrest system should be so designed to limit a free fall to a maximum of two metres
- lanyards must incorporate a shock absorber and be fitted with double action devices. For use as an assembly, see AS/NZS 1891.1 *Industrial fall arrest systems and devices: Harnesses and ancillary equipment* for guidance
- the attachment hardware should be checked for susceptibility to roll-out. A possible problem with the use of attachment hardware is inadvertent roll-out release caused by either:
 - a simple roll-out, when either a small diameter eyebolt or a rope loop can roll-out of a single action snaphook or a double action snaphook if the locking gate is first tripped (see the top diagrams below)
 - when gate loading occurs, which is when two or more large cross-section components in a snaphook of inadequate size exert undue force on the gate when loaded (see the bottom diagrams below)
 - inadvertent tripping of the locking gate occurs.

Defects and damage to lanyards checklist

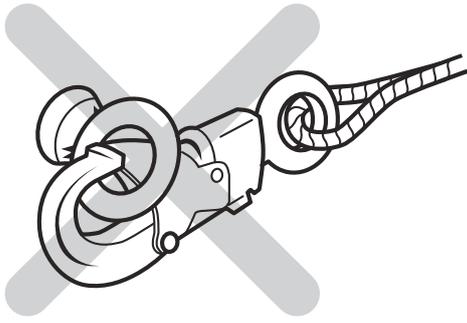
Lanyards should be checked for defects or damage, including:

- cuts of 1 mm or more at the edges of the webbing lanyards (e.g. where the lanyard may have been choke hitched around steelwork)
- surface abrasion across the face of the webbing and at the webbing loops, particularly if localised
- damage to stitching (e.g. cuts or abrasion)
- a knot in the lanyard, other than those intended by the manufacturer
- chemical attack resulting in local weakening and softening, which is often indicated by flaking of the surface. There may also be a change to the colour of the fibres
- heat or friction damage indicated by fibres with a glazed appearance, which may feel harder than surrounding fibres
- UV degradation, which is difficult to identify, particularly by visual appearance, but there may be some loss of colour (if dyed) and a powdery surface
- a partially-deployed energy absorber (e.g. short pull out of tear webbing)
- contamination (e.g. from dirt, grit, sand or paint etc.) which may result in internal or external abrasion
- damaged or deformed fittings (e.g. karabiners, screw link connectors, scaffold hooks or shackles, etc.)
- damage to the sheath and core of a Kernmantle rope (e.g. rucking of the core detected during tactile inspection)
- internal damage to a cable laid rope.

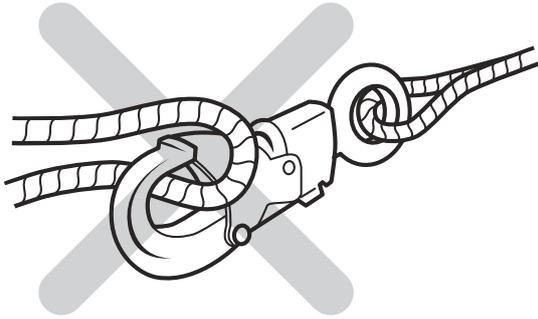
For additional information, refer to the AS/NZS 1891 series and/or the manufacturer's recommendations.

To check a connection for possible susceptibility to roll-out:

- determine how easily moving contact with clothing or equipment can cause initial tripping of the locking gate
- if it looks like tripping is relatively easy, simultaneously twisting the connection in all possible directions will determine whether subsequent roll-out is possible after the locking gate has been tripped.



Roll-out on small diameter eyebolt.



Roll-out on rope.



Side and gate loading of a karabiner. The side loading is correct.

AS/NZS 1891.4 Industrial fall arrest systems and devices – Selection, use and maintenance provides further information on common usage problems.

Snaphooks or karabiners without a double or triple locking device or action must not be used.

Consideration must be given to any special requirements of the materials used in manufacture of the equipment, when choosing the most appropriate fall arrest equipment for a particular application. For example:

- when fall arrest equipment is used while operating chainsaws (e.g. tree pruning, trimming or removal operations), pole straps or belts should be steel core to minimise the effects of accidental cutting
- equipment must be inspected regularly, including inspecting for signs of any damage from cutting, abrasion or heat sources. See also the defects and damage to lanyards checklist in (vi) Harnesses, lanyards and equipment
- workers using safety harnesses, who are outside the safety of handrails, must be attached to an anchorage point or a fall arrest safety system at all times
- workers using safety harnesses should not work alone
- emergency rescue procedures must be developed before work commences.

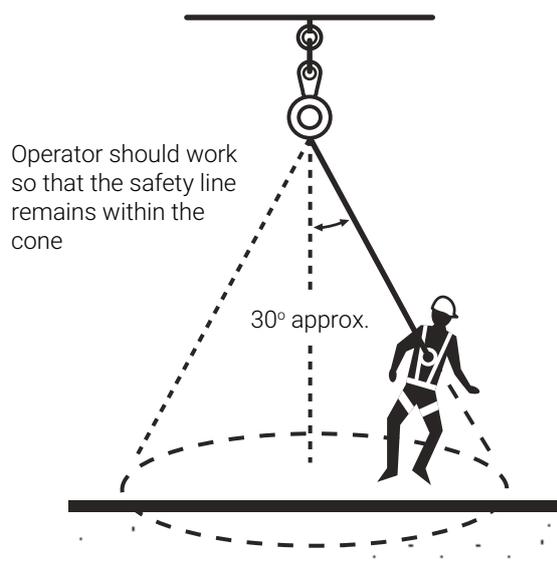
(vii) Inertia reels (self-retracting lanyards)

Inertia reels attach to an anchorage point and pay out a line that is attached to the person's harness. The line is controlled by a spring-loaded reel, which adjusts the line length as the person moves up and down while working. Under fall arrest conditions, the reel locks in position by the same principle as a car seatbelt.

Inertia reels can be used to prevent falls, where workers are required to carry out their work near an unprotected edge.

The safety requirements for the use of inertia reels include:

- the line of the inertia reel must be attached directly to the D ring of the harness
- when using an inertia reel, do not use a lanyard
- inertia reels are not designed for continuous support but become effective in the event of a fall. They should not be used as working supports by locking the system and allowing it to support the user during normal work
- inertia reels may be less effective for certain applications, such as stopping a person falling down an inclined surface. They should be sited only from vertical to 30 degrees, unless specified otherwise in the manufacturer's instructions.



Inertia reel and safety harnesses can be used with a static line or fixed anchorages.

(viii) Drop lines

Drop lines are vertical temporary static lines.

The safety requirements for the use of drop lines include:

- drop lines should be of a minimum knotted strength of 22 kN (approximately equivalent to 2200 kg) and be of a nominal diameter of 11-12 mm
- drop lines should have a fixed eye at one end for attachment to an anchorage point or temporary static line and be knotted at the other end to stop a rope grab device from becoming detached
- a drop line should be of Kernmantle or three strand construction.

Vertical lifelines

A vertical lifeline is a secondary safety drop line used as a back up to arrest a limited free fall in the event of failure of the working line or its attachments.

The safety requirements with the use of a vertical lifeline include:

- use vertical lifelines in connection with work from a swing seat (bosun's chair) or ladder
- only one person should be attached to any one lifeline.

Appendix 5 Contacts for further information

Chamber of Commerce and Industry

180 Hay Street

EAST PERTH WA 6004

Telephone: 1300 422 492

Web: www.cciwa.com

UnionsWA

Level 4, 445 Hay Street

PERTH WA 6000

Telephone: (08) 9328 7877

Web: www.unionswa.com.au

WorkSafe

Department of Mines, Industry Regulation and Safety

Mason Bird Building

Level 1, 303 Sevenoaks Street

CANNINGTON WA 6107

Serious incident and fatality reporting line:

1300 307 877

Web: www.dmirs.wa.gov.au/WorkSafe



Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**

Department of Mines, Industry Regulation and Safety
303 Sevenoaks Street
CANNINGTON WA 6107

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NRS: 13 36 77

Email: Safety@dmirs.wa.gov.au

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