Start time: 7.45am

Participants must read this manual prior to attending the training program and are required to bring the manual to the training program.

Participants must wear fully enclosed steel cap foot wear, long pants and shirt. It is a mandatory requirement that participants must bring photo identification to training session i.e. Australian Drivers licence or passport (must contain photo, date of birth & signature). Failure to provide IDENTIFICATION will result in exclusion from the course.
Contents

WHS Legislation ........................................................................................................................................1
Codes of Practice .......................................................................................................................................1
Australian Standards ............................................................................................................................ 1

Overview of Legislation

Heights Safety & Fall Prevention .............................................................................................................3
Workplace Health And Safety Plans ......................................................................................................4
Risk Management .....................................................................................................................................4
Identifying the Hazards ............................................................................................................................5
Managing The Risk Of Falls ....................................................................................................................5
Assessing The Risk ...................................................................................................................................6
How to Control the Risk ............................................................................................................................8
Hierarchy of Controls ..............................................................................................................................10
Implementing and Maintaining Control Measures ..................................................................................11

Work On the Ground ................................................................................................................................13
Barriers ....................................................................................................................................................16
Edge Protection ......................................................................................................................................17
Hierarchy Of Fall Arrest Options ............................................................................................................20
Passive Fall Prevention Devices ............................................................................................................21
Personal Fall Protection ...........................................................................................................................34
Fall Arrest Systems ..................................................................................................................................36
Individual Fall Arrest Systems ...............................................................................................................37

Fall Protection On Moveable Platforms ..................................................................................................43
Pendulum Affect .......................................................................................................................................47

Static Lines ..............................................................................................................................................48
Suspension Intolerance/ Trauma ...............................................................................................................51
Safety Harnesses .....................................................................................................................................52
Ladders ....................................................................................................................................................55

Administrative Controls ..........................................................................................................................66
Organising and Sequencing Of Work ........................................................................................................67
Safe Work Procedures ..............................................................................................................................67
Emergency Procedures For Falls .............................................................................................................69
Suspension Trauma ................................................................................................................................71
Fork-Lift Work Platforms ..........................................................................................................................72

Working on Fragile Roofing ......................................................................................................................74

Inspection of Belts and Harnesses Check List .........................................................................................80
Inspection of Fall-Arrest Devices Check List ............................................................................................81
Appendix B – Design Of Plant And Structures .......................................................................................83

Design Considerations .............................................................................................................................83
WHS Legislation
South Australia's work health and safety legislation includes the **Work Health and Safety Act 2012 (SA)** and the **Work Health and Safety Regulations 2012 (SA)**, which were adopted on the 1st January 2013.

- The main object of the Act is to provide for a balanced and nationally consistent framework to secure the health and safety of workers and workplaces
- The Work Health and Safety Regulations 2012 (SA) identifies the control measures that must be applied to specific work activities and hazards that occur in the workplace

Codes of Practice
An approved code of practice is a practical guide to achieving the standards of health, safety and welfare required under the WHS Act and the Work Health and Safety Regulations (the WHS Regulations)

Australian Standards
Australian Standards set out specifications and procedures designed to ensure products, services and systems are safe, reliable and consistently perform the way they were intended to. They also act as guidance material to achieve compliance requirements with WHS legislation.

**Overview of Legislation**

- Act
  - Duties of workplace parties
- Regulations
  - Compliment and support the general duties as well as procedural and administrative matters under the WHS Act.
- Codes of Practice
  - Are practical guides to achieving the standards of health and safety required under the WHS Act and Regulations. Codes of practice are admissible as evidence in court proceedings.
- Regulator guidance material, Australian Standards / Industry Standards, other WHS material
  - Further guidance to assist compliance with WHS legislation. To provide 'state of knowledge' along with codes of practice.
### Work Health and Safety Act 2012 (SA)
- 19-Primary duty of care
- 20-Duty of persons conducting businesses or undertaking involving management or control of work
- 21-places
- Duty of person conducting businesses or undertakings involving, management or controls of fixtures, fittings or plant at work places
- 28-Duties of workers

### Work Health and Safety Regulations 2012 (SA)
- 78-Management of risk of falls
- 79-Specific requirements to minimise risk of falls

### Codes of Practice
- Managing the risk of Falls at Workplaces
- Preventing falls in housing construction

### Australian Standards
- AS 1657 fixed platforms, walkways, stairways and ladders – design, construction and installation
- AS/NZS 1576 – Scaffolding series
- AS/NZS 1657 – Fixed platforms, walkways, stairways and ladders – design, construction and installation
- AS/NZS 1891.1 Industrial fall arrest system and devices – harness and ancillary equipment
- AS/NZS 1891.2 supp:1-2001 Industrial fall arrest systems and devices-horizontal lifeline and rail
- Systems-prescribed configurations for horizontal life lines (supplement to AS/NZS 1891.2:2001)
- 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 Portable ladders series

### Unit of competence
RIIOHS204D Work Safely at Heights
Heights Safety & Fall Prevention
Falls from heights account for many workplace injuries throughout Australia annually, the sheer cost in human terms as well as in dollars is substantial. The purpose of this training program is to provide participants with the necessary knowledge and skills so they can perform work safely while working at heights or in situations where fall protection is required.

The program will also explore the many and varied fall prevention safety devices which are available along with anchorage and systems for mobile access and ensure every participant completes the program with a clear understanding of the principal for correct selection, fitting and use of safety harness used in fall protection.

We will also look at some of the alternatives and options for having workers perform tasks at height in the workplace and examine a range of these situations for where they most likely occur.

We will investigate the at the principals of Hazard Identification, Risk Assessment and Control measures so we can employ the best strategies available to ensure our own health and safety as well as those that work around us and the public.

What Is Involved In Managing The Risk Of Falls?
Identifying all hazards that can cause persons or objects to fall and understanding the level of risk associated with those hazards will help you make the right decisions about what to do to eliminate or minimise the risks. This process is known as risk management and involves the following steps set out in this Code:

- Identify the fall hazards
- Assess the risks associated with the hazard
- Control risks by implementing the most effective control measure that is reasonably practicable in the circumstances, and
- Review control measures to ensure they are working as planned.

Further guidance on the risk management process generally is available in the Code of Practice: How to Manage Work Health and Safety Risks

Consulting Your Workers
The WHS Act requires that you consult, so far as is reasonably practicable, with workers who carry out work for you who are (or are likely to be) directly affected by a work health and safety matter. If the workers are represented by a health and safety representative, the consultation must involve that representative.

Consultation involves sharing of information, giving workers a reasonable opportunity to express views and taking those views into account before making decisions on health and safety matters. 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 risk controls.
Consulting, Co-Operating and Co-coordinating Activities with Other Duty Holders

The WHS Act requires that you consult, co-operate and co-ordinate activities with all other persons who have a work health or safety duty in relation to the same matter, so far as is reasonably practicable.

Sometimes you may share responsibility for a health and safety matter with other business operators who are involved in the same activities or who share the same workplace. For example, if you operate a transport company with large trucks, you need to consult the goods suppliers as well as the businesses having the goods delivered about how the risk of falls will be controlled during loading and unloading. This may include checking whether suitable equipment is available at each site so that workers do not have to climb on top of loads on the truck and be at risk of falling. Never assume that someone else is taking care of a health and safety matter. Find out who is doing what and work together with other duty holders in a co-operative and co-ordinated way so that all risks are eliminated or minimised as far as reasonably practicable.

Workplace Health And Safety Plans

A workplace health and safety plan is a tool that can be used to manage workplace health and safety.

Who should prepare a Workplace health and Safety plan?
- A principle contractor at a construction workplace (for the workplace); and an
- Employer or self-employed person carrying out specified work (for the work).

The plan must state:
- Hazards to health and safety
- Assessment of the risks which may result because of the hazards
- Control measures to be used to prevent or minimise the level of the risks
- How the control measures are to be monitored and reviewed.

The plan must state the control measures to be used to prevent
- The risk of injury where people, at or near a workplace, may be exposed to the risk of falling from height.
- Control measures should be in place before a person starts working at heights. For example, ensure working platforms are in place before formwork is erected.

The three levels of control measure available to protect people from the risk of a fall, in order of preference, are:
1. Erecting a physical barrier
2. Providing personal fall protection
3. Measures to “catch” a person after they have fallen.

In some circumstances more than one control measure may be necessary.

Risk Management

Risk management is the process of finding out what can cause an injury, deciding what could happen as a result and doing something about it.

The steps of risk management are:
- Identify the hazards
- Assess the risks
- determine and implement control measures
- Monitor and review the effectiveness of the control measures.
Identifying the Hazards

Identify Hazards prior to commencing work. There are a number of ways to identify potential sources of injury. The selection of the appropriate procedure will depend on the type of work processes and hazards involved.

Consultation with workers is one of the easiest and most effective means of identifying hazards. Based on their experience with a job, workers are usually aware of what can go wrong and why. Specialist practitioners and representatives of industry associations, unions and government bodies may be of assistance in gathering health and safety information relevant to falls from heights.

Factors that can cause a person to fall include:
- Sudden acceleration or deceleration
- Moving from one surface to another
- The capability of the surface to support the load
- Openings or holes that are not identified or protected
- Open edges that are not protected
- Change of levels
- Loss of hand grip
- Slippery surfaces (e.g. surfaces are wet, polished or oily)
- Unsuitable footwear
- Equipment, tools, or rubbish obstructing work areas
- Incorrect use of ladders
- Clothing ‘catching’
- Moving surfaces
- Unsatisfactory lighting
- Bad weather conditions (e.g. heavy rain or wind)
- Being struck by moving or falling object and
- Lack of, or incorrect use of fall-arrest systems and devices not provided or are used incorrectly.

Managing The Risk Of Falls

Step 1 – How to Identify Fall Hazards
You must identify all physical locations and tasks that could cause harm due to a fall, whether it is a person or an object falling. This includes access to the areas where work is to be carried out.

Tasks that need particular attention are those carried out:
- On any structure or plant being constructed or installed, demolished or dismantled, inspected, tested, repaired or cleaned
- On a fragile surface (for example, cement sheeting roofs, rusty metal roofs, fibreglass sheeting roofs and skylights)
- On a potentially unstable surface (for example, areas where there is potential for ground collapse)
- Using equipment to work at the elevated level (for example, when using elevating work platforms or portable ladders)
- On a sloping or slippery surface where it is difficult for people to maintain their balance (for example, on glazed tiles)
- Near an unprotected open edge (for example, near incomplete stairwells), and
• Near a hole, shaft or pit into which a worker could fall (for example, trenches, lift shafts or service pits).

Inspect the Workplace
Walk around the workplace and talk to your workers to find out where work is carried out that could result in falls. A checklist may be useful in this process. Key things to look for include:

• surfaces:
  • The stability, fragility or brittleness
  • The potential to slip, for example where surfaces are wet, polished or glazed
  • The safe movement of workers where surfaces change
  • The strength or capability to support loads, and
  • The slope of work surfaces, for example, where they exceed 7 degrees.
• Levels—where levels change and workers 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 a work platform
• The working area—whether it is crowded or cluttered
• Entry and exit from the working area
• Edges—protection for open edges of floors, working platforms, walkways, walls or roofs
• Holes, openings or excavations—which will require guarding
• Hand grip—places where hand grip may be lost, and
• Loads and objects being moved or stored in an elevated position—whether they are secured against falling.

In some situations, you may need advice from technical specialists, such as structural engineers, to check the stability of structures or load bearing capacity.

Review Available Information, Including Incident Records
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.

Assessing The Risk
Risk Assessment allows appropriate control measures to be developed. Once hazards have been identified, they should be assessed in terms of their potential to do harm.

To assess risk, consideration should be given to the:
• Likelihood that harm will occur and
• Severity of the harm should it occur.

Various techniques can be used to carry out a risk assessment.
Factors to consider when assessing the likelihood and severity of risk include the:

- Potential sources of injury and illness
- Number of people who may be exposed
- Location of the work area
- Location of access routes
- Type of work to be carried out
- Work practices in use
- Scheduling of work
- Type of plant, machinery and equipment and
- Training and experience of the people carrying out the work.

How to Assess the Risk

A risk assessment will help you determine:

- what could happen if a fall did occur and how likely it is to happen
- how severe a risk is
- whether any existing control measures are effective
- what action you should take to control the risk
- How urgently the action needs to be taken.

A risk assessment is unnecessary if you already know the risk and how to control it. When assessing the risks arising from each fall hazard, the following matters should be considered:

- the design and layout of elevated work areas, including the distance of a potential fall
- the number and movement of all people at the workplace
- the proximity of workers to unsafe areas where loads are placed on elevated working areas (for example, loading docks) and
- where work is to be carried out above people and there is a risk of falling objects, the adequacy of inspection and maintenance of plant and equipment (for example, scaffolding)
- the adequacy of lighting for clear vision
- weather conditions—the presence of rain, wind, extreme heat or cold can cause slippery or unstable conditions
- the suitability of footwear and clothing for the conditions
- the suitability and condition of ladders, including where and how they are being used
- the adequacy of current knowledge and training to perform the task safely (for example, young, new or inexperienced workers may be unfamiliar with a task)
- The adequacy of procedures for all potential emergency situations.

Generic Risk Assessment

If you are responsible for a number of different work areas or workplaces and the fall hazards are the same, you may perform a single (or generic) risk assessment. However, you should carry out a risk assessment on individual fall hazards if there is any likelihood that a person may be exposed to greater, additional or different risks.
How to Control the Risk

There are a number of ways to control the risks of falls. Some control measures are more effective than others. Control measures can be ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of control. The WHS Regulations require duty holders to work through this hierarchy to choose the control that most effectively eliminates or minimises the risk in the circumstances. This may involve a single control measure or a combination of two or more different controls. In managing the risks of falls, the WHS Regulations require the following specific control measures to be implemented, where it is reasonably practicable to do so:

1. Can the need to work at height be avoided to eliminate the risk of a fall? „Carry out any work that involves the risk of a fall on the ground

2. Can the fall be prevented by working on solid construction?

A building or structure that is used as an existing place of work and includes safe access and egress from which there is no risk of a fall from one level to another, for example properly constructed stairs with fixed handrails, flat roofs with a parapet or permanently installed guard rails around the edges.

It is usually not necessary to implement additional control measures to manage the risk of falls for workplaces in buildings that already comply with the requirements of the National Construction Code of Australia, for example in relation to stairs, mezzanines and balconies.

3. The risk of a fall be minimised by providing and maintaining a safe system of work, including:
   • Providing a fall prevention device (for example, installing guard rails) if it is reasonably practicable to do so, or
   • Providing a work positioning system (for example, an industrial rope access system) if it is not reasonably practicable to provide a fall prevention device, or
   • Providing a fall-arrest system, so far as is reasonably practicable, if it is not reasonably practicable to provide a fall prevention device or a work positioning system.

In some cases a combination of control measures may be necessary, for example using a safety harness while working from an elevating work platform.

Control measures are needed where there is a risk of injury irrespective of fall height. For low falls, you should assess the risk and provide reasonably practicable measures that reflect the risk. For example, there may be a risk of injury to workers standing on a narrow 1.7 metre high platform next to a production line where they have to work with their back to the open edge or where there is a risk of falling onto an uneven surface with sharp edges or protrusions. In this situation it may be reasonably practicable to install a guard rail along the edge of the platform.

Sometimes it may not be reasonably practicable to provide guard rails, for example at the edges of railway platforms or vehicle inspection pits. Other safe systems of work to provide adequate protection should be implemented, for example brightly painted lines to designate edges.

Eliminate the Hazard and Associated Risk

The first priority is to eliminate fall hazards by eliminating the need to work at height, for example, by carrying out the work on the ground, or work on a solid construction.

Eliminating hazards and risks is often cheaper and more practical to achieve at the design stage of structures or plant by integrating fall prevention systems into the design. For example, design permanent guard rails or other types of edge protection, such as parapet walls, as part of the structure. Further information about preventing falls in the design and planning stage is at Appendix B.
Minimise the Risk by Using a Passive Fall Prevention Device
A passive fall prevention device is any equipment that is designed to prevent a fall and which, after installation, does not require ongoing adjustment, alteration or operation by a person to the means by which it is designed to prevent a fall. These include installing edge protection, using temporary work platforms or guard railing.

Minimise the Risk by Using a Work Positioning System
A work positioning system involves the use of equipment, other than a temporary work platform, that enables a person or thing to be positioned and safely supported at a location for the duration of the work being carried out, for example, travel restraint systems and industrial rope access systems.

Work positioning systems require a higher level of operator competency and supervision than control measures which are higher on the hierarchy of control. Accordingly, they must only be used where it is not reasonably practicable to use a passive fall prevention device.

Minimise the Risk by Using a Fall Arrest System
A fall arrest system is equipment that is designed to prevent or reduce the severity of an injury to a person if a fall does occur, for example, catch platforms, industrial safety nets and safety harnesses.

In some cases a combination of control measures may be necessary, for example using a safety harness while working from an elevating work platform.

Work of long duration and higher frequency will usually require control measures higher up the hierarchy to provide adequate protection, for example using a mobile scaffold instead of a ladder. You should also ensure that the control measures you select do not create new hazards, for example electrical risks from contact with overhead power lines or crushing and entanglement from plant such as elevating work platforms.

![Hierarchical Controls Diagram](image-url)
Hierarchy of Controls
Control measures, which make the workplace safe, are likely to be more effective than measures which protect employees from a hazardous worksite. When adopting measures to control a hazardous risk, the management or consultative team is responsible for selecting the controls to be implemented. Measures from the top of the control hierarchy give better results and should be adopted wherever possible. Measures from the bottom of the hierarchy are more difficult to maintain and should be regarded as interim measures until preferred ones can be implemented.

Most of the time a range of controls selected from the hierarchy of control is needed to bring the level of risk down to an acceptable level.

1. **ELIMINATION**
Elimination completely removes the hazard and is the ideal control solution. Examples of elimination include removing the hazard completely (for example: backfilling holes and trenches promptly), ceasing to use a hazardous substance or changing a process to remove the need for a hazardous action.

2. **SUBSTITUTION**
Substitution is where a hazard is replaced by a less hazardous alternative. For example, instead of using a hazardous item of plant or equipment, substitute it for a less hazardous item that serves the same purpose, such as: using scaffolding instead of working from ladders, using electric or approved LPG powered plant in areas with limited ventilation, etc.

3. **ISOLATION**
Isolation involves separating the hazard from people by the use of physical barriers to contain / enclose the hazard or segregate by distance.
   - Barricades, fencing
   - Keeping hazardous materials out of the lunch room
   - Segregating defective equipment

4. **ENGINEERING CONTROL**
The next preferred control measure is engineering control, which can include:
   - Modification of tools and equipment like guarding
   - Local exhaust ventilation
   - Using water to suppress dust on materials and haul roads is a common form of engineering control
   - Providing adequate fresh air to all workers through appropriate and effective ventilation
   - Placing and securing covers to voids

5. **ADMINISTRATIVE CONTROL**
Administrative control involves the introduction of safe work practices that reduce risk by limiting the exposure to the worker from the hazard. This includes measures such as;
   - Reducing the number of workers exposed by relocation
   - Reducing the period of exposure,
   - Rotating workplace activities,
   - Special procedures to be followed for the use of chemicals
   - Evacuation procedures
   - Placing signs
   - Effective training
   - Documentation such as risk assessments and work plans, policies and procedures
6. PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment must be used where all other control measures have not been fully effective. Practicable efforts to remove health and safety risks using measures higher up in the control hierarchy chain should continue. It is often difficult to fully protect the worker with personal protective equipment and is generally difficult to properly maintain a personal protection program as workers can be required to wear several items of PPE simultaneously which affect comfort and restrict performance and this reduces acceptance of the equipment. Where protective equipment is used, the employer should ensure that it fits the worker correctly, that training is provided on its need and use, its limitations and that it is serviced regularly and properly stored.

Where personal protective equipment is used, it must:

- be appropriate for the job
- meet the required standards
- fit the operator correctly
- come with training for the operator on its need, use and maintenance
- Be services regularly, by appropriately trained staff.

The WHS act 2012, Sections 28 requires a worker to co-operate with any reasonable policy or procedure of the person conducting the business or undertaking relating the Health and Safety at the workplace that has been notified to the worker. This includes the requirement to use personal protective equipment as far as is reasonable.

Implementing and Maintaining Control Measures

- You must ensure that the control measures you implement remain effective.
- This includes checking that the control measures are fit for purpose; suitable for the nature and duration of the work; are installed and used correctly.

To allow the chosen control measures to operate effectively, you should:

- Develop work procedures on how to correctly install, use and maintain the control measure.
- The procedures should include a planned program of inspections and maintenance for the control measures.

The inspection regime should include details of:

- The equipment to be inspected (including its unique identification)
- The frequency and type of inspection (pre-use checks, detailed 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.

The manufacturer and/or supplier of the equipment should be consulted for any product specific requirements. If any signs of wear or weakness are found during the inspection, the components or means of attachment must be withdrawn from use until they are replaced with properly functioning components.

- Provide information, training and instruction to workers, including procedures for emergency and rescue. You should also cover:
- The type of control measures used to prevent falls
- Procedures for reporting fall hazards and incidents
• The correct selection, fitting, use, care, inspection, maintenance and storage of fall-arrest and restraint equipment
• The correct use of tools and equipment used in the work (for example, using a tool belt instead of carrying tools)
• Control measures for other potential hazards (for example, electrical hazards).
• Provide supervision by ensuring that workers exposed to a risk of a fall are adequately supervised by a competent person, especially if they are undergoing training or are unfamiliar with the working environment.

Check that:
• Only workers who have received training and instruction in relation to the system of work are authorised to carry out the work
• Workers use the fall control measure in the correct manner
• Monitor and Review Of Control Measures

The risk management process requires regular monitoring to ensure the control measures that have been implemented have performed as intended. Regular reviewing also ensures that the risk management process continues to prevent or adequately control the risk of injury from falls from heights. A written record that details when control measures were last reviewed should be kept.

Minimise the risk using ladders, administrative controls and other reasonably practicable steps

If it is not reasonably practicable to use any of the above control measures, or if there is a remaining risk of falls, you may consider using ladders

Administrative controls include ‘no go’ areas, procedures for working safely at height and using signs to warn people of a fall hazard

If the only risk controls used to minimise a risk of a fall over two metres are ladders, administrative controls or other reasonably practicable steps (other than passive fall prevention devices, work positioning systems or fall arrest systems), then you must make a record of the control to be implemented and the reasons why higher order risk controls cannot be used. If the work being carried out is construction work, then the preparation of a safe work method statement will meet this requirement.

The use of ladders and administrative controls are the least effective control measures because they rely on people’s behavior to reduce the risk of a fall occurring and require a high level of supervision.

In some cases, a combination of control measures may be appropriate, for example, using safety harnesses while working from an elevating work platform.

You should also ensure that the control measures you select do not create new hazards, for example, electrical hazards from contact with overhead power lines or crushing and entanglement from plant such as elevating work platforms.

Some of the control measures designed to control the risk of persons falling may also be adapted to control the risk of falling objects, for example, a catch platform with a perimeter screen will arrest a worker’s fall and contain any falling objects before they hit a person below the work area.
Step 4 – How to Review Control Measures
The control measures that are put in place to prevent falls must be reviewed, and if necessary revised, to make sure they work as planned and to maintain an environment that is without risks to health and safety.

A person conducting a business or undertaking must review and as necessary revise fall control measures:

- When the control measure does not control the risk so far as is reasonably practicable
- Before a change at the workplace that is likely to give rise to a new or different health and safety risk that the control measure may not effectively control
- If a new hazard or risk is identified
- If the results of consultation indicate that a review is necessary
- If a health and safety representative requests a review.

Control measures may be reviewed using the same methods as the initial hazard identification step.

Consult your workers and their health and safety representatives and consider the following:

- Are the control measures working effectively in both their design and operation?
- Are all fall hazards being identified?
- Are workers using the control measures in accordance with the instruction and training that has been provided?

Work On the Ground
Eliminating the need to work at height is the most effective way of protecting workers from the risk of falls. Examples of eliminating the risk by working on the ground include:

- Prefabricating roofs at ground level
- Prefabricating wall frames horizontally, then standing them up
- Using mechanical tarp spreaders to cover loads on trucks from the ground
- Fitting outlets, inlets and controls of large tanks and silos near the ground (see Figure 1)
- Reducing shelving heights so that workers can access items from ground level
- Using tools with extendable handles, such as paint rollers (the risk of musculoskeletal disorders will need to be considered when deciding whether to use such tools)
- Installing windows that pivot to enable cleaning from a safe position inside a building
- Lowering a concert hall chandelier to repair it.
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.

Work On a Solid Construction
Working on a solid construction provides an environment where the likelihood of a fall may be eliminated. ‘Solid construction’ means an area that:

- Is structurally capable of supporting workers, material and any other loads applied to it is provided with barriers around its perimeter and around any openings from or through which a person could fall
- Has an even, accessible surface and gradient
- Has a safe means of entry and exit.

Structural Strength
Different types of work involve different loads on the supporting surface. The surface and its supports must be able to safely carry the expected loads, including workers, materials, tools and equipment. When in doubt, have a structural engineer determine the safe load capacity before use.
Barriers
Barriers (or edge protection) to prevent a person falling over edges and into holes should be provided on relevant parts of a solid construction. These include:
- The perimeters of buildings or other structures
- Mezzanine floors
- Openings in floors
- The open edge of a stair, landing, platform or shaft opening

The barrier should be designed and constructed to withstand the force of someone falling against it. Edge protection should consist of guard rails, solid balustrades or other structural components, for example wire mesh supported by posts and provided with a reinforced top edge.

The top of the guard rail or component should be between 900 mm and 1100 mm above the working surface. If a guard rail system is used, it should also have mid-rails and toe boards or wire mesh infill panels. If access is required to equipment (for example, a hoist) it should be protected with gates, safety chains or other means to prevent a person falling.

Protection of Openings and Holes
Holes, penetrations and openings through which a person could fall should be made safe immediately after being formed.
If a cover is used as a control measure, it must be made of a material that is strong enough to prevent persons or objects falling through and must be securely fixed to prevent any dislodgement or accidental removal.

Structural Strength
Different types of work involve different loads on the supporting surface. Make sure that the surface and its supports can safely carry the expected loads, including workers, materials, tools and equipment. When in doubt, have a structural engineer determine the safe load capacity before use.

Physical Barriers
Physical Barriers are the preferred method of preventing a person from falling from height. Other measures will not always prevent the person from being injured.

For example, fall-arrest systems may prevent a person from falling to another working surface. However, the person using the system may suffer an injury as a result of the load placed on their body by the fall arrest harness.

A person may lose their balance and fall from a working platform and be caught by a catch net. However, because the fall was unexpected the person may suffer an injury through landing in the catch net awkwardly.

Examples of physical barriers include:
- Edge protection systems
- Fall protection covers
- Working platforms.
**Edge Protection**

Edge protection should be provided on the exposed edges of a solid construction. These include:

- The perimeters of buildings or other structures
- Mezzanine floors
- Perimeters of skylights or other fragile roof materials
- Openings in floor or roof structures, and
- The open edge of a stair, landing, platform or shaft opening.

The edge protection should be designed and constructed to withstand the force of someone falling against it.

Edge protection should consist of a guard rail or other structural component that prevents a person falling over the edge. The top of the guard rail or component should be between 900 mm and 1100 mm above the working surface. If a guard rail system is used, it should also have mid rails and toe boards or wire mesh infill panels (see Figure 3).

**Figure 3:** Example of guard rail with wire mesh panels

If access is required to equipment (for example, a hoist) it should be protected with gates, safety chains or other means to prevent a person falling.

**Protection of Openings and Holes**

Holes, penetrations and openings through which a person could fall should be made safe immediately after being formed.

If a cover is used as a control measure, it must be capable of withstanding any impact and static loads, and must be securely fixed to prevent any dislodgement or accidental removal.

Holes or openings in concrete floors should, where reasonably practicable, be guarded with embedded wire mesh and covered with material that is strong enough to prevent objects or persons falling through (see Figure 4).

Holes or openings in any other type of (non-concrete) floor should be covered with material that is strong enough to prevent objects or persons falling through and be securely fixed to the floor. All covers should be marked clearly with the words ‘Danger - Hole Beneath’ (see Figure 5).
Surface and Gradient
Surfaces of solid construction should be non-slip, free from trip hazards and should generally not exceed 7 degrees (1 in 8 gradients). Cleared surfaces, which provide greater slip-resistance, should not be steeper than 20 degrees (1 in 3 gradients). If grid meshes or checker plate flooring is used for walkways and working platforms ensure that:

- Flooring panels are securely fixed and assembled in accordance with manufacturer’s specifications
- Where possible, they are fitted to the structure prior to it being lifted into permanent position
- Each panel is fixed securely before the next panel is placed in position, during installation, this type of flooring is 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, edge protection is provided and the gaps left due to removed panels are protected.
Fall Protection Covers
Fall protection covers are a protective structure placed over holes and openings to prevent falls. All holes and openings (except lift shafts and stairwells) should have fall protection covers in place.

A cover should be capable of supporting the impact of a person falling onto it. Fall protection covers are usually sheeted with:

- Solid sheeting (timber, plywood or metal) or mesh.

Holes or openings covered with wire mesh should not be used as a working platform. All covers should be securely fixed around the hole. Signs should also be attached to the cover to warn people that there is a hole underneath. For example, metal mesh is spread on top of purlins or battens to provide fall protection for roof installers from falling between the purlins or battens.

Entry and Exit
The solid construction must have a safe means for people to get to, from and move around the work area, for example permanently installed platforms, ramps, stairways and fixed ladders.

Further guidance is available in AS 1657 Fixed platforms, walkways, stairways and ladders – Design, construction and installation.

Safety considerations include:
- Exposure of access systems to the weather (for example, rain can make surfaces slippery and strong winds can cause loss of hand grip)
- The provision of adequate natural or artificial lighting to all access ways
- The clearance of obstructions so that persons are able to move easily to and from the workplace.
- Portable ladders should only be used where the use of safer systems is not reasonably practicable
Hierarchy Of Fall Arrest Options

PHYSICAL CONTROLS

WORK POSITIONING
Enclose or encapsulate operators in work positioning devices such as elevating work platforms, swing stages or building maintenance units, or support them by means of an industrial rope access system so that the risk of a fall is minimized.

RESTRAINT TECHNIQUE
Equip operators with personal fall-arrest equipment which they can adjust as necessary to prevent them reaching a point where a fall is possible.

LIMITED FREE FALL ARREST
RESTRAINED FALL ARREST
Equip operators with personal fall-arrest hardware which will not prevent a fall but will limit the distance and severity of the fall.

FREE FALL ARREST
Equip operators with personal fall-arrest hardware which will not prevent a fall but will minimize the risk of injury in the event of a fall.

SUPPLEMENTARY ADMINISTRATIVE CONTROLS
(Appropriate for use ONLY in conjunction with physical controls)

SAFE SYSTEMS OF WORK
Allow only operators competent in the relevant safe system of work to access hazardous areas.

PROVISION FOR RESCUE
Make advance provision for the rescue of operators in the event of a fall.

EXCLUSION AREA
Consider visually demarcated exclusion area (e.g. painted lines) to inhibit access to fall-risk locations where the risk is not obvious, e.g. brittle roofing that looks similar to the rest of the roof.

FIGURE 1.2 HIERARCHY OF FALL-ARREST OPTIONS
Passive Fall Prevention Devices
A passive fall prevention device is any equipment that is designed to prevent a fall and which, after installation, does not require ongoing adjustment, alteration or operation by a person to the means by which it is designed to prevent a fall. This Chapter provides examples of these devices.

Temporary Work Platforms
A ‘temporary work platform’ is a working platform, other than a permanently installed fixed platform, used to provide a working area for the duration of the job. The design of the platform prevents workers from falling. Temporary work platforms include scaffolds, elevating work platforms, mast climbers, work boxes, building maintenance units, portable or mobile fabricated platforms or any other platform that provides a working area and is designed to prevent a fall.

Scaffolding
Scaffolding can be very effective protection in preventing falls; however, there are specific requirements that apply to some types of scaffold under the WHS Regulations.

A person with management or control of a workplace must not allow the use of a scaffold from which a person or object could fall more than four metres unless a competent person provides written confirmation that the scaffold has been completed. The person must also ensure that:

- the scaffold is inspected by a competent person before use, after any incident that could affect its stability (such as a severe storm), after any alteration or repair, and at least every 30 days
- unauthorised access is prevented on scaffolding that is incomplete and left unattended (for example, by attaching danger tags and warning signs at appropriate locations)

Scaffolding work platforms are generally rated as:
- Light duty 225Kg per bay
- Medium duty 450Kg per bay or
- Heavy duty 675kg per bay.

Safety considerations include:

- Scaffolding conforms to AS/NZS 4576 Guidelines for scaffolding and the AS/NZS 1576 Scaffolding series
- All scaffolding is erected, altered and dismantled by competent persons. Any scaffold from which a person or object could fall more than four metres must be erected, altered and dismantled by or under the direct supervision of a licensed scaffolder.
- Prefabricated scaffolds are of the same type and not mixed components, unless the mixing of components has been approved by the manufacturer
- Safe access to and egress from the scaffold is provided, and
- Edge protection (hand rails, mid-rails and toe boards) is provided at every open edge of a work platform.
Information, instruction and training for workers using scaffolds

Where work is performed from a scaffold, you must ensure that the relevant workers understand:
- What loads the scaffold can safely take
- Not to make any unauthorised alterations to the scaffold (such as removing guard rails, planks, ties, toe boards and braces)
- That working platforms need to be kept clear of debris and obstructions along their length, and
- Incomplete or defective scaffolds must never be accessed.

Where work is performed using mobile scaffolds, workers should understand that the scaffold:
- Should remain level and plumb at all times
- Be kept well clear of power lines, open floor edges and penetrations
- Should not be accessed until the castors are locked to prevent movement
- Should never be moved while anyone is on it, and
- Should only be accessed using internal ladders

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Light Duty Suspended Scaffold (I.E. Swing Stages)
A suspended scaffold incorporates a suspended platform which is capable of being raised or lowered when in use (see Figure 8). Common types of suspended scaffolds include:

- Swing stages which have cradles supported by a single row of suspension ropes
- Double rope scaffolds, with cradles supported by two rows of suspension ropes
- Work cages which are small cradles supported by one suspension rope only
- False cars are specialised forms of suspended scaffolding, which are often used in the construction of lifts before lift cars are installed.
There are specific safety considerations for swing stages, including that:

- The working load and specifications are in accordance with AS 1576.4 Scaffolding – Suspended Scaffolding
- Persons operating light duty suspended stages are trained in safe operation
- Persons installing or servicing a light duty suspended stage hold a licence for advanced rigging or advanced scaffolding
- Safety harness and restraint lanyard, attached to an independent anchored life line, are worn by any person working in a swing stage suspended with one wire rope to each winch, and
- Where the swing stage is suspended by two wire ropes to each winch, a safety harness and restraint lanyard is attached to a suitable anchor point of the swing stage.

Further guidance on the safe design, erection and use of scaffolding, including suspended scaffolding is available in the Scaffolding Code of Practice [under development].

Figure 8: Example of a light duty suspended scaffold with two wire ropes to each winch. A vertical life line should be used. It must be ensured that the platform remains horizontal, when moving it up or down.
Elevating Work Platforms
Elevating Work Platforms (EWPs) include scissor lifts, cherry pickers, boom lifts and travel towers. There are battery powered and internal combustion engine types. Some are designed for hard flat surfaces only, while others are designed to be operated on rough terrain.

The safety considerations include that:

- Workers operating the platform are trained and instructed in safe operating procedures for the particular brand and type of equipment, as well as the safe use of fall arrest equipment and emergency rescue procedures.
- The platforms are only used as working platforms and not as a means of entering and exiting a work area unless the conditions set out in AS 2550.10 are met.
- Unless designed for rough terrain, the platforms are used only on a solid level surface.
- The surface area is checked to make sure that there are no penetrations or obstructions which could cause uncontrolled movement or overturning of the platform.
- When designed for rough terrain, the manufacturer’s or supplier’s instructions are consulted for information on safe operation.
- Persons working in travel towers, boom lifts or cherry pickers wear a properly anchored safety harness, and
- Workers are licensed when operating elevating work platforms with a boom length of 11 metres or more.

Example Elevated Work Platform

Figure 9: An example of a boom-type elevating work platform. The safety harness and lanyard assembly are not shown for purposes of clarity. The lanyard should be as short as possible and should be attached directly to the designated anchor point on the EWP, not to the handrail.
Example Scissor Lift

**Figure 10:** An example of a scissor-lift elevating work platform. As with boom-type platforms, people should not climb onto or off of the platform when it is in an elevated position.

**Mast Climbing Work Platforms**
Mast climbing work platforms are hoists with a working platform that is used to raise workers and material to a temporary working position. They use a drive system mounted on an extendable mast, which may be tied to a building.

Mast climbing work platforms can be set up in either single-mast or multi-mast configurations. They are generally not suitable for use if the profile of a structure changes at different elevations (for example, if the upper floors of a building 'step' back or balconies protrude from the building).

The erection and dismantling of mast climbing work platforms must be carried out, or directly supervised, by a person holding an appropriate rigging or scaffolding license.

Further information on mast climbing work platforms is provided in AS 2550.16 Cranes—Safe Use—Mast climbing work platforms.

**Figure 11:** An example of a typical mast climbing work platform.
**Work Boxes**

A work box is designed to be supported by a crane, hoist, forklift truck or other mechanical device to provide an elevated work area for persons working from the box. They consist of a platform surrounded by an edge protection system, and should be designed in accordance with AS 1418.17. Cranes (including hoists and winches) —Design and construction of workboxes.

Where reasonably practicable, other working platforms, such as an elevating working platform or scaffold, should be used as an alternative to the work box.

The safety requirements and considerations include that:

- The work box is not suspended over persons
- The work box is designed for the task and securely attached to the crane. 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 remain substantially within the work box while they are being lifted or suspended
- Workers do not enter or leave the workbox when it is suspended (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 (lashed) accordingly, and the operator remains at the controls of the crane at all times.

For specifications for the use of crane work boxes refer to AS 2550.1 Cranes, Hoists and Winches—Safe Use—General Requirements.

**Forklifts with a Work Box**

A work box fitted to a forklift must be securely attached to the forklift carriage and engineer designed and constructed in accordance with AS 2359 Powered Industrial Trucks (see Figure 12).

The safety considerations include that:

- People are not raised on the tynes of forklift trucks or the pallet
- No other device (for example, ladder or pallets) is used to gain additional height (see Figures 13 and 14), and
- The safety gate is self-locking and kept shut when in the elevated position.
Figure 12: An example of an engineer-designed work box with safety harness and lanyard assembly, correctly positioned on the forklift tynes.

Figure 13: Using a forklift as a working platform or to gain extra height by standing on the tynes or a pallet is an unacceptable practice.
**Figure 14:** Unacceptable practice with ladder on forklift.
**Building Maintenance Units**
Designers of buildings should consider the methods by which maintenance, repairs or cleaning will be undertaken on buildings or structures.

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 (see Figure 15).

![Figure 15: An example of a building maintenance unit with safety harness and restraint line.](image)

The safety considerations include that:

- The platform has sufficient, clearly designated safety harness anchorage points designed to withstand the forces caused by a fall of any person located anywhere on the platform, and
- The units are designed in accordance with AS 1418.13 Cranes (including Hoists and Winches) —Building Maintenance Units and operated by competent persons in accordance with AS 2550.13 Cranes—Safe Use—Building Maintenance Units.
Platforms Supported By Trestle Ladders
Trestle ladder scaffolds are only suitable for use at heights greater than two metres when guard rails and toe boards are incorporated to prevent people and material falling off the working platform. The system (including planks) should be assembled according to the manufacturer’s specifications.

Some trestle ladder scaffolds include outriggers to increase stability. Trestle ladder scaffolds are only suited to light duty tasks such as painting and rendering. Work should only be performed between the trestles. The minimum width of the working platform should not be less than 450 mm.

Alternatives to trestle ladders should be considered, such as small scissor lifts, light duty aluminium mobile scaffolds, boom arms and modular scaffolding.

Perimeter Guard Rails
Guard rails may be used to provide effective fall prevention:

- at the edges of roofs
- at the edges of mezzanine floors, walkways, stairways, ramps and landings
- on top of plant and structures where access is required (see Figures 17 and 18)
- around openings in floor and roof structures, and
- At the edges of shafts, pits and other excavations.

Guard rails should incorporate a top rail 900mm to 1100 mm above the working surface and a mid rail and a toe board.

Before using a guard rail system, you should check that it will be adequate for the potential loads. The required load resistance will depend on the momentum of a falling person. For example, the momentum of a person falling from a pitched roof will increase as the pitch (or angle) of the roof increases.

Refer to AS/NZS 4994—Temporary Edge Protection series for further guidance.

Guard rail systems should be used on the edge of:
- working platforms
- walkways
- stairways
- ramps
- Landings
A guard rail should run parallel to the working surface and not be further than 100mm outside the edge of the working surface. The guard rail height should be between 900mm and 1100mm above the working surface.

Guard rails must have mid rails. A mid rail is a structural member secured midway between the guardrail and the working surface. It should run parallel to the working surface and be no further than 100mm outside the edge of the working surface. Both the guard rail and the mid rail should be able to withstand the impact of a person falling against them.

A toe board is a vertical barrier used in conjunction with guard rails and mid rails to prevent a person from falling under the guard rail. Toe boards may be fully sheeted with timber or metal or made from mesh and extend a minimum of 150mm above the work surface.

**Figure 17:** Guard rails installed on top of a tanker to enable safe access to tank hatches.

**Figure 18:** A platform with guard rails installed above silos
Safety Mesh

Safety mesh is designed to prevent internal falls through a roof. If securely fixed, safety mesh provides fall protection for roof installers and offers long-term protection against falling for maintenance and repair workers.

Safety mesh does not prevent falls from the edge of a roof or through holes in a roof, so it should always be used in conjunction with appropriate edge protection, guardrails or individual fall-arrest systems.

Safety mesh should comply with AS/NZS 4389 Safety mesh or most recent equivalent, which specifies the minimum requirements for the design, construction, testing and installation of safety mesh for use in domestic, commercial and industrial building applications.

The mesh should be formed from 2 mm diameter wire of not less than 450 MPa tensile strength, welded into a mesh with the longitudinal wires not more than 150 mm apart and the cross wires not more than 300 mm apart.

Safety mesh should be inspected and certified by a competent person as being installed in accordance with the manufacturer’s instructions. Where existing safety mesh is to be used to control the risk of workers falling, the integrity of the mesh and its fixings should also be verified by a competent person before use.

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, and then the safety mesh should be removed.

Installing Safety Mesh

Safety mesh should be installed by competent persons, who should be protected against the risk of falling by using appropriate control measures such as scaffolding, elevating work platforms or individual fall arrest systems.

Particular care is required to ensure that the mesh is securely connected to the structure and the overlap between adjacent sections of mesh is sufficient to generate the necessary strength to resist the force of a person falling onto it. The safety mesh should be covered by the roof cladding as soon as reasonably practicable after it has been installed.

Figure 19 shows one satisfactory method for installing safety mesh. The mesh is first cut to the right length from the roll and is then run out over the roof using a continuous rope system. Installers should not walk across the open purlins to draw the mesh.
Figure 19: Mesh can be installed safely from scaffolding positioned at each end of the roof. Persons should not walk on safety mesh that is not designed as a work platform. Safety mesh should never be used for access to or egress from a work area.

Industrial Rope Access Systems
Industrial rope access systems are used for gaining access to and working at a workface, usually by means of vertically suspended ropes. Although fall-arrest components are used in the industrial rope access system, the main purpose of the system is to gain access to a work area rather than to provide backup fall protection (see Figure 18).

Other methods of accessing a workface should be considered (for example, EWPs or building maintenance units) before rope access systems, as a high level of skill is needed for their safe use.

You should ensure that, where it is necessary for industrial rope access systems to be used:

- Operators are competent in the technique
- Operators do not work alone, in case they require assistance in an emergency
- Industrial rope access systems are installed only in a location where it is possible to provide prompt assistance or rescue if required (refer to Chapter 9 of this Code)
- All equipment is checked regularly by a competent person prior to use
- All fixed anchorage points are checked by a competent person before attaching the rope access lines
- A backup system is used to protect the operator
- Two independently anchored ropes are used for each person
- Any person within three metres of an unguarded edge is adequately secured
- All operators wear a full body harness
- Supervisors can communicate with workers
- Where necessary, appropriate personal protective equipment is used, such as helmets, gloves, hearing protection, goggles and masks
- Barricades and signposts are placed on all access areas below the working area and anchorage locations to exclude and alert the public and trades people.
Further guidance on industrial rope access systems is available in AS/NZS 4488 Industrial rope access systems series.

**Personal Fall Protection**

Systems of work and equipment that secure a person to a building or structure are known as personal fall protection.

Personal fall protection discussed in this program include ‘travel restriction devices’, ‘fall prevention systems’ and ‘fall arrest systems’.

Use personal fall protection systems when:
- Within the confines of a working platform
- Other forms of fall protection such as guardrails are not available
- Used in conjunction with other measures of fall protection such as safety nets or fixed platforms.

The use of these systems requires active involvement to ensure the equipment is worn, attached and used in the correct way. Where no other forms of fall protection can be used, personal fall protection systems should be used to minimise the risk of:
- a person from falling from a height (travel restriction devices)
- Injury to a person after a person has fallen from a height (fall arrest systems).

**Rescue and First Aid**

Analysis of each work environment should include consideration of the provisions for first aid and rescue of a person working at height who becomes incapacitated, e.g. as a result of a fall, and the preparation of a recovery plan for such an event.

The following should be considered in the preparation of such a plan:

(a) Provision of a means of calling for help by a person whose fall may not have been seen or noticed by others on site.

(b) Provision for possible self recovery or recovery by such means as fall-arrest devices equipped with winching mechanisms for raising or lowering.

(c) The need to rescue an incapacitated person from a location difficult to reach and requiring the use of height safety equipment by the rescuer, and not necessarily following a fall.

(d) The possible need to pre-deploy rescue systems.

(e) The possible need to render urgent first aid to a person prior to rescue coupled with need to get that person to ground as quickly as possible for professional medical assessment and treatment, and assessment of condition of personal protection equipment.

(f) The need to manage the threat of suspension intolerance (trauma) by speedy deployment of a rescue system, generally within a few minutes and whether there needs to be a person at ground level to minimize further injury as well as managing suspension intolerance (trauma).

(g) The following principles

   (i) Rescue should not be reliant on emergency services
   (ii) Rescue should not endanger rescuers or other persons.
   (iii) Rescue should not depend on any action by the person being rescued.
Restraint Technique
A restraint technique controls a person’s movement by physically preventing the person reaching a position at which there is a risk of a fall. It consists of a harness that is connected by a lanyard to an anchorage or horizontal life line. It must be set up to prevent the wearer from reaching an unprotected edge.

A travel 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 hand hold or lateral support. When deciding whether secure footing can be maintained, consider:
  - The slope of the surface
  - The supporting material type, and
  - 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, and the restraint system conforms to the AS/NZS 1891 Industrial fall-arrest systems and devices series.

Travel restraint systems must only be used if it is not reasonably practicable to prevent falls by providing a physical barrier (such as a guard rail). This is because travel restraint systems require a high level of user skill to operate safely and require greater supervision.

A travel restraint system should be installed by a competent person in accordance with the manufacturer’s instructions. Travel restraint anchorages should be designed for fall arrest loading.

An individual fall arrest system should be used instead of a travel 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 the user may fall through the surface, for example fragile roofing material
- The slope is over 15 degrees, and
- There is any other reasonably likely use or misuse of the system which could lead to a free fall.

Types of fall-restraint systems include:
- A work positioning harness. This is worn by a person connected to a restraint line, and this restricts the horizontal distance the wearer is able to travel.
- A fall-prevention static line is a horizontal line connected to a fixed anchorage point, on which a restraint line can be attached to increase the area that can be covered by a person wearing a fall-prevention system.
- A fall-prevention anchorage point is a secure point of attachment to a structure or static line to which a restraint line is attached. An anchorage point of a fall prevention system should be positioned to ensure that the restraint line does not allow the person wearing the system to free fall.
Fall Arrest Systems
A fall arrest system is intended to safely stop a worker falling an uncontrolled distance and reduce the impact of the fall. These systems should only be used if it is not reasonably practicable to use higher level controls, or if higher level controls might not be fully effective in preventing a fall on their own.

Key safety considerations in using fall arrest systems are:

- The correct selection, installation and use of the equipment
- That the equipment and anchorages is designed, manufactured and installed to be capable of withstanding the force applied to them as a result of a person’s fall
- That the system is designed and installed so that the person travels the shortest possible distance before having the fall stopped
- That workers using a fall arrest system wear adequate head protection to protect them in the event of a fall, and
- That if the equipment has been used to arrest a fall it is not used again until it has been inspected and certified by a competent person as safe to use.

Catch Platforms
A catch platform is a temporary platform located below a work area to catch a worker in the event of a fall. The platform should be of robust construction and designed to withstand the maximum potential impact load. Scaffolding components may be used to construct fixed and mobile catch platforms (see Figure 22).

Catch platforms should:

- Incorporate a fully planked-out deck
  Be positioned so the deck extends at least two metres beyond all unprotected edges of the work area, except where extended guard railing is fitted to the catch platform
- Be positioned as close as possible to the underside of the work area—the distance a person could fall before landing on the catch platform should be no more than one metre, and
- Always be used with an adequate form of edge protection.
Individual Fall Arrest Systems

Individual fall arrest systems consist of some or all of the following components:

- 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), and
- Rescue equipment.

Individual fall arrest systems rely on workers wearing and using them correctly, and therefore workers who will use such a system must be trained in its safe use. They should only be used where it is not reasonably practicable to use higher level control measures.
Industrial Safety Nets
Safety nets can provide a satisfactory means of protection while allowing workers maximum freedom of movement. They should not be used to enter or exit a work area or as a working platform.

If safety nets are used, you should ensure that:
- Safety nets are securely anchored before any work starts
- Safety nets are constructed of material strong enough to catch a falling person or thing
- 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 used where there is no edge protection extend at least 2.5 metres beyond the leading edge of the working area
- The safety net has sufficient tension and clearance to prevent a falling person contacting any surface or structure below the net
- Material is not allowed to accumulate in suspended safety nets
- No welding or oxy cutting is performed above safety nets
- Safety nets are inspected, particularly after installation, relocation or repair
- Safety nets are stored correctly in dry, shaded areas with good air circulation.

Installation of Anchorage Points
Each anchorage point (other than an anchorage point supporting a static line) should have a capacity of at least:
- 12kN if only one person is using the anchorage point and the person could have a limited free fall
- 15kN if only one person is using the anchorage point and could have a free fall
- 21kN if 2 persons are using the anchorage point.

All anchorages should be tested and approved by a competent person before use—a visual inspection may not reveal the structural integrity of the anchor point (i.e. the bolt may have failed below the concrete surface). Each anchorage point should be located so that a lanyard of the system can be attached to it before the person using the system moves into a position where the person could fall.

Inspect the System Components
Each component of the system and its attachment to an anchorage must be inspected by a Competent person:
- After it is installed but before it is used
- At regular intervals, and
- Immediately after it has been used to arrest a fall.

Inspection of inertia reels and harnesses should be conducted in accordance with the manufacturer’s specifications and the relevant standards

Free Fall Distance
Fall arrest systems, incorporating a lanyard, should be installed so that the maximum distance a person would free fall before the fall arrest system takes effect is two metres. There should be sufficient distance between the work surface and any surface below to enable the system, including the action of any shock absorber to fully deploy (see Figure 23).
To work out whether there is enough distance available, you should take into account:

- The worker's height
- The height and position of the anchorage point
- The length of the lanyard
- Any slack in the static line
- Any stretching of the lanyard or static line when extended by a fall, and
- The length of the energy absorber when extended by a fall.

Figure 23: Total fall distance before this particular configuration would be effective in arresting a fall is 6.5m.

Use Full Body Arrest Harnesses
A full body fall arrest harnesses should be worn. Waist-type belts should not be used as injuries can result when the wearer's fall is arrested. The harness connection point to the fall arrest line should be made at the top dorsal position. An alternative attachment position is when a line and rope-grab device is used on steeply sloping roofs and the user needs to manually operate the device by having the device in front. In these circumstances the user can make the connection onto a front connection point as recommended by the manufacturer.

Maintain Minimum of Slack in Fall Arrest Line
There should be a minimum of slack in the fall arrest line between the user and the attachment. The anchorage point should be as high as the equipment permits. Never work above the anchor point, as this will increase the free fall distance in the event of a fall, resulting in higher forces on the body and greater likelihood of the arrest line snagging on obstructions.
Use Inertia Reels Correctly

When considering the use of inertia reels, bear in mind that they might not be effective in certain situations. For example, if a worker falls down the inclined surface of a steeply pitched roof, the inertia reel line may keep extending from the reel—it may not lock.

Inertia reels should not be used as working supports by locking the system and allowing it to support the user during normal work. They are not designed for continuous support. Vertical and self-retracting anchorage lines can be used as a risk control measure in connection with work performed from boatswains' chairs and ladders. Where such lines are used, only one person may be attached to any one line.

**The operator needs to stay within 30° of the vertical.**

Lanyards should **not** be used in conjunction with inertia reels as this can result in an excessive amount of free fall prior to the fall being arrested.

Use Compatible Components

Fall arrest systems and safety harnesses should only be used with the individual manufacturer's components known to be compatible. The use of non-compatible components may lead to 'roll-out' with some hook/karabiner configurations, resulting in injury or death to the user. The hazard cannot always be avoided by using components produced by the same manufacturer under the one brand name. If you are unsure whether components of a fall arrest system are compatible you should contact the manufacturer for further information.

Snap hooks should be of the double action type, requiring at least two consecutive deliberate actions to open. Snap hooks should not be connected to each other as this could prevent the safe operation of the snap hook (for example, roll-out may occur). Some double action hooks are susceptible to roll-out. Screw gate karabiners or hex nut connectors may sometimes be appropriate. Further guidance is provided in AS/NZS 1891 Industrial fall-arrest systems and devices

![Roll-out on a small diameter eyebolt.](image)

**Figure 24:** Roll-out on a small diameter eyebolt.

Ensure prompt rescue in event of fall

The rescue of a worker who is suspended in a full body harness must occur promptly to prevent suspension trauma. A worker should not use a fall arrest system unless there is at least one other person on the site who can rescue them if they fall.
Anchorage Lines or Rails
Anchorage lines or rails are temporary or permanent fall-arrest systems, which can be installed to provide continuous fall protection for persons using ladders or climbing towers. These can be used on plant, such as tower cranes, as well as buildings or structures.

Safety considerations include that:
- Temporary systems comply with the AS/NZS 1891 series of standards
- The locking device is attached to the frontal attachment point of the harness and the lanyard assembly is a maximum of 300 mm length „the point of connection onto the ladder by the climber is 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
- Free fall is limited to a maximum of 600 mm „permanent systems are of wire or rail construction and are installed according to the manufacturer’s instructions
- After a fall, remove the system from service and have it inspected by a competent person before it is used again

Double Lanyards
An alternative to anchorage lines or rails is the use of a double lanyard (also known as a twin tail or ‘Y’ lanyard)

However, double lanyards are easy to misuse—there should be no back hooking, they should not be wrapped around the body or passed between the legs, the chest connection should never be higher than the highest attachment point, 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 should be provided on their use

Figure 26 shows how the use of a double lanyard means that the person climbing can always be connected to the ladder or structure.
### TABLE 4.1

**USE OF HARNESSSES AND ASSOCIATED DEVICES IN FALL-ARREST SYSTEMS**

<table>
<thead>
<tr>
<th>Device</th>
<th>Principal uses</th>
<th>Whether permitted for fall-arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full body harness</strong></td>
<td>Any situation with risk of any fall including restraint technique.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Lower body harness</strong></td>
<td>Risk of limited free fall, restrained fall including with pole strap, restraint technique.</td>
<td>No</td>
</tr>
<tr>
<td><strong>Harness with confined space retrieval attachments</strong></td>
<td>Risk of free fall in a confined space where provision for rescue is also required.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Lanyard</strong></td>
<td>Connection of a harness to an anchorage or lifeline.</td>
<td>Yes</td>
</tr>
<tr>
<td>- <strong>single fixed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- <strong>single adjustable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lanyard</strong></td>
<td>As above with facility for transferring among anchorages.</td>
<td>Yes</td>
</tr>
<tr>
<td>- <strong>twin tail</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pole strap</strong></td>
<td>Connection to a harness for work positioning on a pole.</td>
<td>No</td>
</tr>
</tbody>
</table>

* Formerly known as a ‘confined space harness’.

Source: Australian Standard 1891.4
Fall Protection On Moveable Platforms

Users of moveable platforms that require occupants to use fall-arrest rated equipment such as building maintenance units, swing stages and boom type elevating work platforms may find difficulty in providing adequately for the anchoring of fall-arrest equipment to the platforms.

The following requirements and recommendations for the fall protection of people working on these platforms therefore need to be observed:

(a) If an anchorage point with minimum ultimate strength of at least 12 kN cannot be found, the operator shall be limited to the use of a work method that is designed to prevent a fall, i.e. use of restraint technique (see Clause 2.2.5) which will prevent the operator reaching or climbing to a position from which a fall is possible. Fall-arrest rated equipment shall be worn.

(b) If an anchorage with an ultimate strength of 12 kN or more but less than 15 kN is available, a system allowing either restrained or limited free fall may be used.

(c) An operator should not be allowed to reach a position from which a free fall is possible unless attached to an anchorage of ultimate strength at least 15 kN.

(d) In a potential free-fall situation the possibility of encountering the pendulum effect should be considered. This can occur when the anchorage point is neither directly above nor directly behind the operator at the point at which the fall occurs. A typical case is a fall from one end of a swing stage where the operator is anchored to the centre of the stage. A horizontal lifeline or rail within the stage is a possible solution provided adequate strength end anchorages can be found.

(e) The personal fall-arrest equipment to be used is specified in Table 2.1. Typical cases are illustrated in Figure 2.4.

NOTE: Further advice on the anchorage points for these equipments may be obtained by reference to relevant parts of AS 1418 and AS 2550.

Work Task Hazards

Work tasks that may be especially hazardous include the following:

   a) Welding.
   b) Using power tools, especially cutting tools.
   c) Use of abrasives.
   d) Use of chemicals likely to have an adverse effect on equipment.
   e) Electrical work.
   f) Work in explosive or flammable atmospheres.
   g) Work in confined spaces.

Where one or more of these tasks is likely to be encountered, consideration should be given to the following:

   (i) The adoption of altered work practices such as the use of two separate lanyards.
   (ii) The provision of protective sleeves or covers.
   (iii) The purchase of special equipment designed to cope with these hazards.
# TABLE 2.1
CHARACTERISTICS OF VARIOUS RESTRAINT/FALL SITUATIONS

<table>
<thead>
<tr>
<th>Restraint/fall situation</th>
<th>System description</th>
<th>Equipment and anchorage requirements (minimum) (see Notes 1 and 4)</th>
<th>Typical application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restraint technique</td>
<td>A combination of anchorage placement and lanyard length adjustment which will not physically permit the operator to reach a fall-risk position (see Note 2) unless the lanyard is incorrectly adjusted.</td>
<td>Fall-arrest rated equipment as follows: Where any possible fall will only be a limited free fall (&lt;600 mm), a lower-body harness and anchorage with ultimate strength 12 kN. All other cases, a full-body harness and anchorage with ultimate strength 15 kN.</td>
<td>Any situation where access to the work can be achieved entirely on a working surface with secure footing and without exposure to a fall provided that the equipment is correctly adjusted.</td>
</tr>
<tr>
<td>Restrained fall only</td>
<td>A pole-strap of length which will permit only a restrained fall when working on a pole</td>
<td>Full-body or lower-body harness and pole strap.</td>
<td>Working on a pole where no free fall is possible.</td>
</tr>
<tr>
<td>Limited free fall</td>
<td>A combination of anchorage placement and lanyard length which will permit only a limited free fall (&lt; 600 mm).</td>
<td>Full-body or lower-body harness. Lanyard or fall-arrest device that will limit free-fall to 600 mm max. (See Note 2). 12 kN ultimate strength anchorage or equivalent horizontal lifeline or rail.</td>
<td>Any situation where the use of either a short lanyard or a fall-arrest device (or both where applicable) will limit any free fall to 600 mm. May also be applicable to rope access systems, see AS/NZS 4488.2.</td>
</tr>
<tr>
<td>Free fall</td>
<td>Any suitable fall-arrest system.</td>
<td>Full-body harness. Lanyard or fall-arrest device which will limit free fall to 2 m max. (see Note 2). 15 kN ultimate strength anchorage or equivalent horizontal lifeline or rail.</td>
<td>Any situation in which a free fall greater than 600 mm is possible.</td>
</tr>
<tr>
<td>Total restraint</td>
<td>A system where no fall is possible</td>
<td>Not specified in the AS/NZS 1891 Series of Standards (see Note 3).</td>
<td>See Appendix F.</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Fall protection work practices not in accordance with this Standard, in particular, the use of non-complying personal equipment (e.g. lanyards without specified energy absorbing properties), may create fall-arrest forces which will exceed the anchorage strengths specified in the Table.
2. See also Section 8.
3. Whilst no equipment is specified, fall-arrest rated equipment can be used.
4. ‘Ultimate strength’ means that the anchorage may yield at the stated load but must not fail.

Check Australian Standard
(a) Restraint technique—adjustable lanyard

(b) Restrained fall—pole strap

(c) Limited free fall—free-fall distance ≤600 mm

(d) Free fall—free-fall distance >600 mm
Working On Slopes and Work Positioning
Where a user at risk of a fall can maintain secure footing on a sloping surface without
tensioning the lanyard or safety line, or requiring additional support such as hand hold, fall
arrest equipment attached to anchorages of commensurate strength shall be used. Factors that
need to be considered as to whether secure footing can be maintained are as follows:

(a) The degree of slope. Slopes in excess of 15° from the horizontal should always be
checked for risk of a fall.

(b) Surface slipperiness or skid resistance, change from dry to wet conditions and whether
the surface is likely to be oily or otherwise slippery.

(c) Surface roughness likely to become a tripping hazard.

(d) Security when carrying heavy loads or operating hand held equipment.

(e) Unusual weather conditions, high winds, snow, ice or frost.

(f) The grip provided by footwear, e.g. sole material and tread pattern.

Where a user cannot maintain secure footing without the aid of lateral support alternative means
of access or support shall be provided, e.g. a harness and pole strap, a walkway in accordance
with AS 1657 or a work positioning system such as a rope access system in accordance with
AS/NZS 4488.2.

Total restraint
Total restraint is expressly omitted from the scope of AS/NZS Standard. 1891.4 For further
discussion see Appendix F of the standard.
Pendulum Effect

Figure 26: During ‘swing back’ the worker may hit the structure. If there is any risk of ‘swing back’, then the use of an individual fall-arrest system should be reassessed.

Figure 25: During ‘swing down’ the length of the lanyard and positioning of the anchor allow contact with the ground.

Hazards with Individual Fall Arrest Systems Pendulum Effect

If a person using an individual fall arrest system falls, the system may act as a pendulum, and in some situations the user may hit the ground (called ‘swing down’, see Figure 25) or swing back onto the building or structure (which is called ‘swing back’, see Figure 26).

Swing down can occur if the fall arrest line slides back along the perimeter edge of the roof until it is vertical. When this happens, the person may hit the ground, or the arrest line may break as a result of its contact with the edge of the roof. Measures to address ‘swing down’ include:

- The installation of guardrails
- placing the anchorage point at a right angle to the position of the line at the perimeter edge(for example, by using a mobile anchorage), and
- The installation of a second anchorage point and belay devices (intermediate anchorages).
If there is a lateral offset between the line from the anchorage point to the operator and the line or direction of potential fall, in the event of a fall the operator may suffer hazardous lateral swing. This is commonly known as the pendulum effect.

Two common consequences of the pendulum effect are illustrated above. The hazard in the first case is a horizontal collision with a fixed object. In the second case it is a greatly extended fall distance. If the length of unsupported line is equal to or more than the height of the edge above the ground, the operator will strike the ground or other obstacle.

**Static Lines**

Static lines are a useful system that allows workers to move with relative freedom at height along walkways, elevated work places and roof tops where the risk of a fall is present. The systems may be used for all types of fall prevention situations, including Total Restraint, Restrained fall, Limited freefall and Total free fall.

The number of persons using the system at any one time shall not exceed four and the number using any one span at any one time shall be limited to either one or two depending on the number for which provision has been made. The maximum overall length of the line shall be 100 m, and of any one span, 10 m. The line shall run freely through intermediate supports.

Means of passing an intermediate anchorage without complete disconnection from the line shall be used by all users of the system. This is typically achieved by provision of a second lanyard or a dual attachment lanyard similar to that illustrated in Figure 2 below.

Static lines shall be installed in accordance with AS 1891.2 Horizontal Lifeline and rail systems.

**Note:** Any fall arrest system must be installed by an accredited installer and in accordance with AS/NZS1891 Industrial fall-arrest systems and devices – Fall arrest systems.
### TABLE 3.1
STRENGTH REQUIREMENT FOR ANCHORAGES

<table>
<thead>
<tr>
<th>Purpose of anchorage</th>
<th>Ultimate strength in direction of loading (minimum) (see Notes 1 and 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)  <em>Single point anchorages</em></td>
<td></td>
</tr>
<tr>
<td>Free fall-arrest—one person</td>
<td>15</td>
</tr>
<tr>
<td>Free fall-arrest—two persons attached to same anchor</td>
<td>21</td>
</tr>
<tr>
<td>Limited free fall-arrest (including rope access anchorages)</td>
<td>12</td>
</tr>
<tr>
<td>Restraint technique</td>
<td>12 or 15 (see Note 3)</td>
</tr>
<tr>
<td>(b)  <em>Horizontal lifelines</em></td>
<td></td>
</tr>
<tr>
<td>End anchorages</td>
<td>See Clause 6.2.4</td>
</tr>
<tr>
<td>Intermediate anchorages</td>
<td></td>
</tr>
<tr>
<td>—diversion less than 15°</td>
<td>12</td>
</tr>
<tr>
<td>—diversion 15° or more</td>
<td>12+ (see Note 2)</td>
</tr>
</tbody>
</table>

**NOTES:**

1. As far as practicable all single point one-person anchorages should meet the 15 kN requirement regardless of primary purpose.
2. Horizontal component of forces induced during a fall-arrest (multiplied by a safety factor of 2.0) is to be added as indicated in Clause 6.2.5.
3. Anchorage strengths applicable when using a restraint technique, see Clause 2.2.5, are either 15 kN or 12 kN depending on whether the ultimate fall risk is free fall or limited free fall.
4. ‘Ultimate strength’ means that the anchorage may yield at the stated load but must not fail.

Fig 2
FIGURE 6.1 TYPICAL ARRANGEMENT OF A PRESCRIBED CONFIGURATION SYSTEM

NOTE: Care needs to be taken that the energy absorber is not ‘short-circuited’, i.e. by clipping one leg of the dual lanyard back to the harness.
Suspension Intolerance/ Trauma
Suspension intolerance/ trauma is a condition (e.g. following a fall), whereby a person suspended in a harness in a substantially upright position may experience blood pooling in the legs.

Depending on the susceptibility of the individual, this may lead to loss of consciousness, renal failure and eventually death.

In clinical trials, although some subjects experienced no effects after prolonged suspension, others experienced fainting or loss of consciousness in just a few minutes.

The initial indications are that a person’s susceptibility may be unrelated to fitness level or any other obvious physical condition or attributes.

Although the condition is still being researched, it is recommended that certain measures be taken to reduce the effects of this condition or delay its onset. It appears to help if the person is suspended in a substantially horizontal position or with the knees elevated, and with an opportunity to ‘pump’ the legs, ideally with the feet against a firm surface.

The person should be encouraged to maintain leg activity by both moving the legs and where possible pushing with the feet against a firm surface at regular intervals until retrieval can be effected.

It is clear however, that an effective incident response plan is necessary to ensure that following an incident, the person can be removed from the suspended position as quickly as possible. This may include having a pre-rigged retrieval system in place.
Safety Harnesses

5 Simple steps to wearing a harness correctly

1. Pick up the harness by large metal "D"-ring on the back of the harness. Identify the shoulder straps and ensure that waist, chest and/or leg straps are un-buckled, and are not twisted.

2. Pass arms through the loops formed between the shoulder straps and chest straps, keeping the fixed buckle to the left.

3. Adjust the shoulder strap buckles to place the chest strap just below the arm pits. The rear "D" ring should be located high between the shoulder blades. Once this adjustment is complete, fold away excess webbing so that it is not a further hazard.

   All buckles that require fastening involve the quick-connect buckle through the larger buckle and ensure that the buckles are aligned.

4. Connect the two leg straps first, ensuring that the left leg strap goes to the left hip buckle and the right leg strap goes to the right hip buckle. Connect chest and or waist straps.
Hold buckle and tighten all webbing straps to a firm but comfortable fit and slide keepers along the strap webbing to hold and secure any free webbing.
# Inspection Requirements

## TABLE 9.1

<table>
<thead>
<tr>
<th>Items</th>
<th>Reference</th>
<th>Inspection frequency (Note 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal equipment including harnesses, lanyards, connectors, fall-arrest devices including common use devices</td>
<td>Clause 9.2</td>
<td>Inspection by a height safety operator (see Note 2) before and after each use.</td>
</tr>
<tr>
<td>Harnesses, lanyards, associated personal equipment</td>
<td>Clause 9.3.2</td>
<td>6-monthly inspection by a height safety equipment inspector (see Note 3).</td>
</tr>
<tr>
<td>Fall-arrest devices (external inspection only)</td>
<td>Clause 9.3.4(a)</td>
<td>6-monthly inspection by a height safety equipment inspector (see Note 3).</td>
</tr>
<tr>
<td>Ropes and slings</td>
<td>Clause 9.7</td>
<td>12-monthly inspection by a height safety equipment inspector (see Note 3).</td>
</tr>
<tr>
<td>Anchorages—drilled-in type or attached to timber frames</td>
<td>Clause 9.3.3</td>
<td>Frequency of inspection by a height safety equipment inspector as recommended by the manufacturer to a maximum of 5-yearly. 12-monthly inspection in the absence of such recommendations (see Note 3)</td>
</tr>
<tr>
<td>Anchorages—other types</td>
<td>Clause 9.3.3</td>
<td>Frequency of inspection by a height safety equipment inspector as recommended by the manufacturer to a maximum of 5-yearly. 12-monthly inspection in the absence of such recommendations (see Note 3)</td>
</tr>
<tr>
<td>Fall-arrest devices—full service</td>
<td>Clause 9.3.4(b)</td>
<td>Frequency of service by a height safety equipment inspector as recommended by the manufacturer to a maximum of 5-yearly. 12-monthly service in the absence of such recommendations (see Note 3)</td>
</tr>
<tr>
<td>Horizontal and vertical lifelines—steel rope or rail</td>
<td>Clause 9.3.5</td>
<td>Frequency of inspection by a height safety equipment inspector as recommended by the manufacturer to a maximum of 5-yearly. 12-monthly inspection in the absence of such recommendation (see Note 3)</td>
</tr>
<tr>
<td>Horizontal or vertical lifelines—fibre rope or webbing</td>
<td>Clauses 9.3.5 and 9.7</td>
<td>6-monthly inspection by a height safety equipment inspector (see Note 3).</td>
</tr>
<tr>
<td>All items of personal and common use equipment</td>
<td>Clause 9.4</td>
<td>Inspection by a height safety equipment inspector on entry or re-entry into service (see Note 3).</td>
</tr>
<tr>
<td>All items which have been stressed as a result of a fall.</td>
<td>Clause 9.5</td>
<td>Inspection by a height safety equipment inspector before further use (see Note 3).</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Where used in harsh conditions, more frequent inspection may be required.
2. If the user or operator of the equipment is not competent to carry out this inspection it is to be undertaken by another person who is competent, see Clause 9.2.
3. All inspections except those by the operator are to be documented (see Clause 9.10).
Ladders

Ladders Should Be Designed In Accordance With:
- AS 1892.1 - Portable Ladders Part 1 - Metal
- AS 1892.2 - Portable Ladders Part 2 - Timber
- AS 1657 - Fixed platforms, walkways, stairways and ladders - Design, construction and installation
- Designed and constructed to have a load rating of not less than 120kg and marked “industrial use only”.

Portable Step-Ladders Should:
- Not be used on working platforms to gain height above the protected edge, for example next to floors with penetrations or the edge of the floor
- Only be used in the fully opened position
- Be of a length that ensures a person’s feet are not positioned any higher than the third highest tread.

Portable Single and Extension Ladders Should Be:
- Be pitched at a slope of not less than an angle of 1 horizontal to 4 or of not less than an angle of 1 horizontal to 6
- Extend 1m above the last surface where a person can gain access and should not be used:
  - In access areas or within the arc of swinging doors
  - On working platforms to gain height above the protected edge
  - To support a working platform.

If a series of ladders are used to gain access to a surface, landing platforms should be provided at every 6m interval. The ladder should be secured against movement and supported form a firm, level, non-slip surface. Fall arrest systems should be used by person using a ladder as a working surface.
Portable Trestle Ladders should be used only by a person painting and should only be used in the fully opened or closed position. Trestle ladders should not be used where a person can fall 4m or more.

Fixed Ladders are vertical or near vertical ladders fixed to a structure. The ladders should have ladder cages or persons using the ladder should use fall arrest systems. If a series of ladders are used to gain access to a surface, landing platforms should be provided at every 6m interval.

Most ladder-related injuries occur as a result of falls from low heights. Sideways tipping is the cause of most stepladder injuries, and this risk increases as the worker ascends the ladder. In this case, the worker is working above the second tread from the top of the ladder and is at extreme risk of falling. The worker is often working alone and does not have anyone to hold the stepladder to stabilise it.
Use the Correct Ladder for the Job or Task
Selection of Ladders
If ladders are used they must be selected to suit the task to be undertaken. In doing this, you should consider the duration of the task, the physical surroundings of where the task is to be undertaken and the prevailing weather conditions. Ladders should have a load rating of at least 120 kg and be manufactured for industrial use.

Safe Use of Ladders
Any ladder used at a workplace must be set up on a solid and stable surface, and set up so as to prevent the ladder from slipping. Single and extension ladders can be prevented from slipping by:

- Placing ladders at a slope of 4:1, and setting up stepladders in the fully opened position, and
- Securing ladders at both the top and bottom, or if necessary, at both ends (see Figure 27).

**Figure 27**: Some effective ways of securing a ladder

If using ladders, it is not safe to:

- Handle or use ladders where it is possible for the worker or the ladder to make contact with energised power lines, except where the person is qualified to do so
- Use metal or metal reinforced ladders when working on live electrical installations
- set up the ladder in places, such as driveways and doorways, where a person or vehicle could hit it—if necessary, erect a barrier or lock the door shut
- Use a stepladder near the edge of an open floor, penetration, or on scaffolding to gain extra height
- Over-reach (the centre of the torso should be within the ladder stiles throughout the work)
- Use any power or hand tool requiring two hands to operate, such as concrete cutting saws and circular saws
- Use tools which require a high degree of leverage type force which, if released, may cause the user to over balance or fall from the ladder, such as pinch bars
- Carry out work such as arc welding or oxy cutting
- carry large, heavy or bulky items up or down the ladder
- work over other people, or
- Allow anyone else to be on the ladder at the same time.
Figure 28: Examples of unsafe ladder use
Except where additional and appropriate fall protection equipment is used in conjunction with the ladder, it is not safe to:

- Face away from the ladder when going up or down, or when working from it
- Stand on a rung closer than 900 mm to the top of a single or extension ladder, or
- Stand higher than the second tread below the top plate of any stepladder (with the exception of three-rung step ladders).

When a ladder is used, you should check that:

- The ladder is in good condition—the ladder should be inspected for faults, such as broken rungs, stiles and footing before it is used
- Damaged ladders are removed from service
- The ladder is set up on firm, stable and level ground
- The ladder is the correct height for the task to avoid reaching or stretching
- The ladder is not too close or too far from the support structure—the distance between the ladder base and the supporting structure should be about one metre for every four metres of working ladder height (4:1 ratio)
- The ladder is secured against displacement (i.e. slipping or sliding) and/or there is another person holding the base of the ladder
- The ladder is not placed so that the weight of the ladder and any person using the ladder is supported by the rungs
- All the locking devices on the ladder are secure
- Materials or tools are not carried while climbing the ladder—use 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
- Slip resistant base, rungs or steps are provided
- Slip resistant shoes are worn
- Ladders are not used without additional appropriate precautions:
  - In access areas or doorways—if necessary, erect a barrier or lock the door shut
  - On scaffolding or an elevating work platform to get extra height
  - Next to power lines unless the worker is trained and authorised and the appropriate ladder is being used
  - In very wet or windy conditions
  - Next to traffic areas, unless the working area is barricaded.
When Using Ladders, It Is Not Safe To:

- Use metal or metal reinforced ladders when working on live electrical installations
- Carry out work such as arc welding or oxy cutting
- Work over other people
- Allow anyone else to be on the ladder at the same time.

Except where additional and appropriate fall protection equipment is used in conjunction with the ladder, it is not safe to:

- Use a stepladder near the edge of an open floor, penetration or beside any railing
- Over-reach (the centre of the torso should be within the ladder stiles throughout the work)
- Use any power or hand tool requiring two hands to operate, such as concrete cutting saws and circular saws
- Use tools that require a high degree of leverage force which, if released, may cause the user to over-balance or fall from the ladder, such as pinch bars
- Face away from the ladder when going up or down, or when working from it
- Stand on a rung closer than 900 mm to the top of a single or extension ladder
- Stand higher than the second tread below the top plate of any stepladder (with the exception of three-rung step ladders).

Guidance on the selection, safe use and care of portable ladders is set out in AS/NZS 1892 Portable ladders series. The manufacturer’s recommendations on safe use should also be followed.
Figure 29: A step platform can provide a stable work surface

**Access or Egress**
Where fixed or extension ladders are used for access or egress, check that:

- There is a firm and level work platform, free from obstructions, to step onto from the ladder
- The ladder extends at least one metre above the stepping-off point on the working platform, and
- Edge protection is provided at the stepping off point where people access the working platform.
Figure 30: Example of acceptable ladder use
Additional control measures to prevent falls may be necessary with the use of portable ladders, such as fall arrest systems, pole straps or the installation of fixed ladders.

![Pole straps used with portable ladders](image)

**Figure 31:** Pole straps used with portable ladders

Guidance on the selection, safe use and care of portable ladders is set out in the AS/NZS 1892 Portable ladders series.

**Fixed Ladders**

Ladder and tower safety systems should be installed on fixed ladders (for example, rung ladders). The ladder cages in fixed ladders do not stop a fall but simply funnel a fall and, in some cases, more injuries can occur from striking the protective back guards on the way down. 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.

Fixed ladders should be installed in accordance with AS 1657 Fixed Platforms, Walkways, Stairways and Ladders—Design, Construction and Installation. 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 below) or a double lanyard harness.

A specifically designed rescue procedure should be developed for use in ladder cage situations. Training in the rescue procedures should occur prior to the use of the fixed ladder.
Figure 32: Example of a fixed ladder fitted with a ladder cage
Ladder and Tower Safety Systems
Ladder and tower safety systems are temporary or permanent fall arrest systems, which can be installed to provide continuous fall protection for persons using ladders or climbing towers. These can be used on different types of plant, such as tower cranes, as well as buildings or structures.

The safety considerations include that:
- Temporary systems comply with the requirements of droplines
- The locking device is attached to the side or frontal attachment point of the harness and the lanyard assembly is a maximum of 300 mm length
- The locking device is not capable of damaging the line in the event of a fall
- The point of connection onto the ladder by the climber is 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
- Free fall is limited to maximum of 600 mm
- Permanent systems are of wire or rail construction and are installed according to the manufacturer’s instructions
- Wire systems accord 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
- The entire device is capable of sustaining a load of 12 kN (approximately equivalent to 1200 kg), and
- Rail devices are anchored in accordance with AS/NZS 1891.3 Industrial fall-arrest systems and devices—Fall-arrest devices. They should be sited to allow clearance of the self-locking device. Junction points may be installed to allow both vertical and horizontal movement.

Ladder Maintenance
Ladders should be regularly inspected by a competent person. Ladders with any of the following faults must be replaced or repaired:
- Timber stiles warped, splintered, cracked or bruised
- Metal stiles twisted, bent, kinked, crushed or with cracked welds or damaged feet
- Rungs, steps, treads or top plates which are missing, worn, damaged or loose
- Tie rods missing, broken or loose
- Ropes, braces, or brackets which are missing, broken or worn, and
- Timber members that are covered with opaque paint or other treatment that could disguise faults in the timber.

Administrative Controls
Administrative controls are systems of work or work procedures that help to reduce the risks of falls when it is not reasonably practicable to use a higher order control. Administrative controls should only be used to support other control measures and may include ‘no go’ areas, permit systems, the sequencing of work and safe work procedures.
‘No Go’ Areas
‘No go’ areas can be an effective method of making sure people are not exposed to hazards. They require clear signs warning people not to access the hazardous area. They can be used to highlight the risks of entry to an area where there is an unguarded hazard, or to areas where work is being undertaken overhead and there is a risk of falling objects.

You should ensure that relevant information and instruction is provided about ‘no go’ areas, and that there is adequate supervision to ensure that no unauthorised worker enters the ‘no go’ area. Barriers should be used in conjunction with signs to cordon-off areas where there is a risk of falling or being hit by falling objects. They should be highly visible and securely fixed to prevent displacement.

Permit Systems
Permit systems ensure that only competent persons trained in the use of relevant control measures work in an area where there is a hazard. Examples include:

- Tagging all access points to a scaffold to prevent unauthorised access during erection and dismantling, with ‘only licensed scaffolders permitted on an incomplete scaffold’,
- Requiring permits for access to areas where travel restraint systems or fall arrest systems are to be used.

Organising and Sequencing Of Work
You should make sure that the work is organised so that people do not interfere with other workers or increase the risk to themselves or others. For example, you can sequence jobs so that different trades are not working above or below each other at the same time. Plan the work so tasks are not performed for extended periods from a ladder, or so that work at height is minimised in extremely hot or cold weather.

Safe Work Procedures
An administrative control may be as simple as a safe work procedure that describes the steps involved in safely undertaking a task. It may also include any particular training, instruction and the level of supervision required. For example, a safe work procedure to reduce the risk of falls when entering or exiting vehicles may include instructing drivers to not jump down from the cab and always maintain three points of contact when climbing into or out of the cab (see Figure 36).
Figure 36: Safe procedures for climbing in and out of trucks
Recording Administrative Controls
If administrative controls are used as a means of reducing the risk associated with work over two metres, you must make sure details of the administrative controls are recorded, including the reasons for not implementing higher order control measures.

These records must be kept until the work covered by the administrative controls has been completed. If relying on administrative controls, it may be necessary to provide a high level of supervision to ensure that the safe work procedure is being adhered to.

Emergency Procedures For Falls
Whenever there are risks from working at height, appropriate emergency procedures and facilities, including first aid, must be established and provided. Under the WHS Regulations, the person conducting a business or undertaking must establish emergency and rescue procedures to address fall hazards, including:

- Emergency procedures relating to the use of risk control measures, and procedures to rescue a person who is exposed to a fall hazard and in need of emergency assistance.

The procedures must be tested so that they are efficient and effective. The person conducting the business or undertaking must provide workers with suitable and adequate information, instruction and training.

Emergency Procedures
In developing emergency procedures, the different types of emergency and rescue scenarios that might arise should be considered. Information from the risk assessment will help in this task. Emergency procedures will also depend on the type of control measures that are used to address fall hazards, for example, suspension trauma can occur with the use of fall arrest systems. When establishing emergency procedures, you should take into account:
<table>
<thead>
<tr>
<th>Relevant Considerations</th>
<th>Questions</th>
</tr>
</thead>
</table>
| Location of the work area | Is the work at height being undertaken in a remote or isolated place?  
How accessible is it in an emergency and how far away is it from appropriate medical facilities?  
Can the rescue of a person after an arrested fall be provided immediately, without the need to rely on emergency services? |
| Communications | How can workers working at height communicate in an emergency? |
| Rescue equipment | What kinds of emergencies may arise? The provision of suitable rescue equipment will depend on the nature of the work and the control measures used, for example, an emergency rapid response kit with man-made fibre rope, according to AS/NZS 4142.3 Fibre ropes—Man-made fibre rope for static life rescue lines.  
Selected rescue equipment should be kept in close proximity to the work area so that it can be used immediately. |
| Capabilities of rescuers | Are rescuers properly trained, sufficiently fit to carry out their task and capable of using any equipment provided for rescue (e.g. breathing apparatus, lifelines and fire-fighting equipment)?  
Have emergency procedures been tested to demonstrate that they are effective? |
| First aid | Is appropriate first aid available for injuries associated with falls?  
Are trained first aiders available to make proper use of any necessary first aid equipment |
| Local emergency services—if they are to be relied on for rescue? | How will the local emergency services (e.g. ambulance) be notified of an incident? |

You must ensure that workers have access to first aid equipment and facilities for the administration of first aid. You must also ensure that workers are trained to administer first aid or that workers have access to persons who are trained in first aid. Facilities for the provision of first aid are addressed in the First Aid in the Workplace Code of Practice.

The emergency procedures for falls may be incorporated into the emergency plan required for the workplace under the WHS Regulations.
Suspension Trauma
Suspension trauma can occur with a fall arrest system when a person has an arrested fall and is suspended in an upright, vertical position with the harness straps causing pressure on the leg veins. The lower legs’ capacity to store large amounts of blood reduces the return of blood to the heart, slowing the heart rate which can cause the person to faint. This may lead to renal failure and eventually death, depending on a person’s susceptibility. This 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 workers 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.

Preventing Suspension Trauma
You can prevent suspension trauma occurring as a result of an arrested fall by ensuring that:

- Workers never work alone when using a harness as fall protection
- Workers use a sit type harness, which allows legs to be kept horizontal
- The time a worker spends in suspension after a fall is 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 are trained to do the following when they are hanging in their harness after a fall:

- Move their 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, and
- Move their 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, and
- Harnesses are selected for specific applications, with consideration given to comfort, potential injuries and suspension trauma.

Training for Rescues
The training for rescuing workers who have fallen and are suspended in an upright position should address the following factors to prevent suspension trauma:

- The rescue process starts immediately because being suspended in an upright position for longer than five minutes has the potential to cause death, and
- 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.
Plant
Safety considerations at the design stage could include:

- Providing adequate steps and hand rails on vehicles (see Figure 34)
- Incorporating a fall 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.

Designers must provide information to each person who is provided with the design that includes information on the purpose for which the plant was designed and how to use the plant safely.

Lighting
Lighting at the workplace should be not less than:

- 200 lux for a working area,
- 50 lux for stairs or other areas providing access to a working area.

Housekeeping
Materials, tools and equipment on working platforms should be stored so as to leave at least 450mm clear access.

Weather
Exposure to the weather should be given consideration when establishing the area for an access way. For example, rain may make surfaces slippery or strong winds may cause loss of balance.

Warning Signs
Warning signs should be erected to warn persons of the risk of falling from a height. The signs should be positioned where they will be clearly visible to persons working in the area.

Protective Clothing
Footwear that minimises the risk of slipping should be worn when working where there is a risk of falls from heights. Consideration should be given to the surface being worked on.

For example, a surface slippery from wet conditions. Safety helmets should be fitted and attached to the person’s head so that they remain in place should they be arrested by fall protection equipment during a fall.

Fork-Lift Work Platforms
These are used to elevate personnel for various working activities, using the lifting ability of a fork-lift or similar industrial truck. A work platform is specially designed for mounting on the elevating device of a high lift fork-truck for the purpose of providing a safe working place for personnel. Many serious accidents and injuries occur when people fail to use a correctly designed work platform, or if they use it in an inappropriate manner. These occur either from falls, or being trapped by moving parts of the fork-lift elevating system.

Standing on the fork-lift tynes, on pallets or in unsuitable stillages, are common causes of falls from height.
Design and Construction of working platforms is required to be manufactured in accordance with Australian Standard 2359, “Powered Industrial Trucks” and the safe work procedures must also comply with this Standard and the Occupational Health, Safety & Welfare Regulations.

- Work platforms must be provided with duplicate, independent locks to securely attach the platform to the fork-lift, and be clearly visible to personnel in the platform.
- The work platform must be designed only to be located on the fork-lift in the correct position.
- Work platforms shall have a slip resistant floor surface not larger than 1200mm x1200mm, and with 100mm high toe boards on all sides.
- The front and sides shall have guard rails at least 900mm high with a back guard 2000mm high with a mesh infill barrier to prevent access to any moving parts of the forklift lifting mechanism.
- The self-closing access gate shall be sliding or inward opening, and be securely fastened while in use.
- A warning notice visible to personnel in the work platform shall be attached to identify the load weigh limit and the two person load limit.

**Safe Use of Work Platforms**
- Prior to the use of a fork-lift, operators must be assessed as competent by a registered assessor or have proof of training/experience.
- The work platform must be secured to the fork-lift.
- The driver of the fork-lift must remain seated at the controls of the fork-lift at all times while personnel are elevated in the work platform.

**Work Platforms**
Work platforms provide a permanent or temporary surface for people to carry out work. The platform should be secured against uplift or displacement to a structure and be installed with an edge protection system. The area of the working platform should be of a size and strength to safely support the tools, materials and people who may be working on it.
When using a working platform:
- Platforms supported by a crane or hoist that are designed for the carrying of materials, should not be used for carrying people.
- A person’s body should not protrude from the confines of the working platform while it is moving.

For example, a mast climber.
Working platforms should not be used in wind conditions that may result in the working platform becoming unstable.

For example; a boatswain’s chair or work boxes.
Working platforms should not be less than 450mm in width or length. Plant used to support working platforms should be used in accordance with the designer and/or manufacturer’s instructions.

For example, an elevated working platform.
Different types of working platforms include:
- Working platforms on scaffolds consist of planks or prefabricated platforms secured against uplift or displacement.
- A fall-arrest static line is a horizontal or vertical line made of metal tube, metal rod, steel wire rope and synthetic webbing or synthetic rope, for a ladder fall-arrest system.
- The line is connected to a fixed anchorage point at each end, to which a lanyard can be attached.
- A personal-energy absorber is used in conjunction with a fall arrest harness and lanyard to reduce the deceleration force imposed by a suddenly arrested fall and correspondingly reduces loading on the anchorage. The energy absorber may be a separate item or included as part of the lanyard.
- A ladder belt is a belt connected to a lanyard, then attached to a ladder fall-arrest device.
- A ladder fall-arrest device is one that travels along a fall arrest static line parallel to a ladder and locks to the line when loaded. The device can only be loaded in the direction of the line.

Working on Fragile Roofing

Fragile Surfaces
Roofs should be assumed to be covered with a brittle or fragile material unless they are specifically identified as metal and in sound condition. Brittle or fragile roofing materials include:
- Asbestos cement roof sheets
- Cellulose cement roof sheets
- Glass, fibreglass, acrylic or other moulded or fabricated synthetic material used to sheath a roof or contained in a roof
- Box gutters made of asbestos cement products
- Skylights in old buildings, and
- Corroded sheet metal roofing.
No One Should Walk Directly On Fragile Material.

Figure 37: Severe deterioration of roofing materials may not be readily apparent from the upper surface.

Many old roofs have no wire mesh under brittle sheets. Danger signs should be fixed at points of access to the roof. If a person is required to work on a surface of material that can break, easily snap or shatter or is weak or perishable, you should ensure that:

- The person is informed that there is fragile or brittle roofing
- Work is carried out from a safe working platform that is located and constructed to allow work to be performed safely
- Safe access to the work area is provided to enable workers to step directly onto a safe platform or area
- Temporary walkways at least 450 mm wide are provided, with edge protection, as a means of access to and egress from any work area where permanent walkways are not provided
• Timber cleats on temporary walkways are provided where the slope of the roof exceeds one to six, cleats should be fixed to the top side of the walkway planks, and the walkway should be adequately secured
• Warning signs are displayed at all points of access to any work area where fragile material is present, and are securely fixed in positions where they will be clearly visible to persons accessing the work area
• Temporary roof ladders are provided if the roof is steeply sloping (i.e. in excess of 35 degrees) and used in conjunction with an individual fall arrest device
• There is another person present at all times when work is being performed on a fragile surface in case there is an emergency
• That any part of a roof and/or surface that contains fragile materials that allow light to enter a building or structure is safeguarded
• 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, and
• 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.
• 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 1100 mm above the roof level at the perimeter and includes a mid rail and toe board should be used.

**Grid Mesh and Checker Plate Flooring Panels**
Grid mesh and checker plate flooring is used for walkways, access ways and working platforms. Panels are easy to dislodge if not fixed securely and missing panels are a severe hazard. Consequently, access to areas with missing panels, except for repair work, must be prevented.
Figure 38: Missing grid mesh panels are a severe hazard.
The safety considerations include that:

- Flooring panels are securely fixed and assembled in accordance with manufacturer’s specifications
- Where possible, they are fitted to the structure, prior to it being lifted into permanent position
- Each panel is fixed securely before the next panel is placed in position
- During installation, this type of flooring is secured by tack welding, panel grips or other means to prevent movement before being fixed permanently, and
- If panels of grid mesh or checker plate flooring are removed, edge protection is provided and the gaps left due to removed panels are protected.

**Emergency Procedures for Falls**

Whenever there are risks from working at height, appropriate emergency procedures and facilities, including first aid, must be established and provided.

Under the WHS Regulations, the person conducting a business or undertaking must establish emergency and rescue procedures to address fall hazards, including:

- emergency procedures relating to the use of risk control measures, and
- procedures to rescue a person who is exposed to a fall hazard and in need of emergency assistance.

The procedures must be tested so that they are efficient and effective. The person conducting the business or undertaking must provide workers with suitable and adequate information, instruction and training.
Buildings and Structures
Designers or constructors of buildings or structures must ensure, so far as is reasonably practicable, that workers involved with the construction, use or subsequent maintenance are not exposed to the risks associated with work at height. Therefore, at the design and planning stage, it is important to consider providing fall prevention systems as part of the building or structure.

As it is unlikely that all design work on larger projects will be carried out by one designer, consultation, co-operation and co-ordination should occur between the builder and other designers 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.

The design and planning for the construction stage should include:
- Reducing the risk for those working at heights, such as the installation of guard rails to perimeter structural members prior to erection
- Reducing the time spent working at heights by pre-fabricating modules on the ground, before lifting them into position
- Sequencing of the work to be performed at heights
- the location and condition of access roads, for example to enable a crane to place building materials in the most appropriate and accessible location, rather than the materials being moved manually
- preparation of the ground or floor below the work area. It should be compacted and level to support plant or equipment, such as cranes and scissor lifts
- identification of underground services including drainage, for example for the safe setting up of cranes
- „provision of permanent safety mesh.

Planning For Building Maintenance
During the planning stage, consideration should also be given to the methods by which maintenance, repairs or cleaning will be undertaken on a building or structure, for example:
- designing window cleaning bays or gangways integrated into the structural frame
- designing permanent anchorage and hoisting points into structures where maintenance needs to be undertaken at height.

Planning the Site Layout
When planning the site layout, the following factors should be considered:
- The preparation of firm, level surfaces below work areas for the support of plant and equipment, such as scissor lifts or mobile scaffolds
- The site and condition of access roads to enable plant to place material in and pick it up from the most favourable positions, thereby reducing, for example, the need for manual handling at height
- safe access to and egress from work areas and amenities, including the provision and placement of stairways, ladders, catwalks, guardrails and barriers
- the need for adequate means of escape and rescue in the event of an emergency.
## Inspection of Belts and Harnesses Check List

<table>
<thead>
<tr>
<th>Component</th>
<th>Condition or fault to be checked</th>
<th>Tick OK or mark X &amp; comment for action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Webbing</td>
<td>Cuts or tears</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abrasion damage especially where there is contact with hardware</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excessive stretching</td>
<td></td>
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<tr>
<td></td>
<td>Damage due to contact with heat, corrosives, or solvents</td>
<td></td>
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<tr>
<td></td>
<td>Deterioration due to rotting, mildew, or ultraviolet exposure</td>
<td></td>
</tr>
<tr>
<td>Snap hooks and karabiners</td>
<td>Distortion of hook or latch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cracks or forging folds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wear at swivels and latch pivot pin</td>
<td></td>
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<tr>
<td></td>
<td>Open rollers</td>
<td></td>
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<tr>
<td></td>
<td>Free movement of the latch over its full travel</td>
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<tr>
<td></td>
<td>Broken, weak or misplaced latch springs (compare if possible with a new snap hook)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Free from dirt or other obstructions, e.g. rust</td>
<td></td>
</tr>
<tr>
<td>D-rings</td>
<td>Excessive 'vertical' movement of the straight portion of the D-ring at its attachment point on to the belt, so that the corners between the straight and curved sections of the D become completely exposed.</td>
<td></td>
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<tr>
<td></td>
<td>NOTE: Excessive vertical movement of the ring in its mounting can allow the nose of larger snap hooks to become lodged behind the straight portion of the D, in which position the snap hook can often Accidentally 'roll out' of the D under load.</td>
<td></td>
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<tr>
<td></td>
<td>Cracks, especially at the intersection of the straight and curved Portions</td>
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<tr>
<td></td>
<td>Distortion or other physical damage of the D-ring</td>
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<td></td>
<td>Excessive loss of cross-section due to wear</td>
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<tr>
<td>Buckles and adjusters</td>
<td>Distortion of other physical damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cracks and forging laps where applicable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bent tongues</td>
<td></td>
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<tr>
<td></td>
<td>Open rollers</td>
<td></td>
</tr>
<tr>
<td>Sewing</td>
<td>Broken, cut or worn threads</td>
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<tr>
<td></td>
<td>Damage or weakening of threads due to contact with heat, corrosives, solvents or mildew</td>
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<tr>
<td>Ropes</td>
<td>Cuts</td>
<td></td>
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<tr>
<td></td>
<td>Abrasion or fraying</td>
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<tr>
<td></td>
<td>Stretching</td>
<td></td>
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<tr>
<td></td>
<td>Damage due to contact with heat, corrosives, solvents, etc</td>
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</tr>
<tr>
<td></td>
<td>Deterioration due to ultraviolet light or mildew</td>
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<tr>
<td>Chains</td>
<td>Physical damage</td>
<td></td>
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<tr>
<td></td>
<td>Security of attachments to snap hooks, rings, and similar components</td>
<td></td>
</tr>
</tbody>
</table>
## Inspection of Fall-Arrest Devices Check List

Fall arrest ID………………………………………. Date…../………/……………..

<table>
<thead>
<tr>
<th>Component</th>
<th>Condition or fault to be checked</th>
<th>Check</th>
<th>Comment for action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rope or webbing including anchorage lines for Type 2/3 devices</strong></td>
<td>Cuts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abrasion or fraying</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stretching</td>
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<tr>
<td></td>
<td>Damage due to contact with heat, corrosive, or solvents</td>
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<tr>
<td></td>
<td>Excessive dirt or grease impregnation</td>
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<tr>
<td></td>
<td>Anchorage of the anchorage line to the anchorage point (Type 1 devices)</td>
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<tr>
<td></td>
<td>Anchorage of the rope end to the drum when the rope is fully extended (Type 2/3 devices)</td>
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<td></td>
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<tr>
<td><strong>Fall-arrest device body</strong></td>
<td>Mounting ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical damage or wear, especially at any pivot points</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Cracks, especially in corners</td>
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<tr>
<td></td>
<td>Mounting security</td>
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<td></td>
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<tr>
<td></td>
<td>Body</td>
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<tr>
<td></td>
<td>Physical damage such as significant dents, distortion, or corrosion</td>
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<tr>
<td></td>
<td>Presence of foreign bodies such as small stones within body (to be checked without dismantling)</td>
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<tr>
<td></td>
<td>Loose or missing screws, nuts or similar objects (external check only)</td>
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<tr>
<td></td>
<td>Position of the clutch compression indicator button (fitted only to rewind drums with steel rope)</td>
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<tr>
<td></td>
<td>Fall-arrest indicator (if fitted)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Signs of activation</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Correct-use labels and service label or tag</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Presence and legibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Locking mechanism rope guides</strong></td>
<td>Excessive wear or ridging on externally visible rope guides</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secure locking and holding of rope-locking mechanism when the rope is given a sharp tug</td>
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<tr>
<td></td>
<td>Free running of rope through the anchorage with no tendency to stick or bind, and on rewind drum anchorages, complete rewinding of the rope without loss of tension</td>
<td></td>
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<tr>
<td><strong>Hardware</strong></td>
<td>Condition and locking action of any associated snaphooks or links</td>
<td></td>
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</tbody>
</table>

**Name of Inspector…………………………………………………..**
APPENDIX A – TERMS USED IN FALL CONTROL MEASURES

Anchorage
Means a secure point for attaching a lanyard, lifeline or other component of a travel restraint system or fall arrest system. Anchorages require specific load and impact capacities for their intended use.

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.

Free fall
Is any fall or part of a fall where the person falling 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.

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.

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
Means a line used, usually as part of a lanyard assembly, to connect a harness to an anchorage point or static line.

Lanyard assembly
Means an assembly consisting of a lanyard and a personal energy absorber. The lanyard assembly should be as short as reasonably practicable, with a working length of not more than two metres.

Personal energy absorber or deceleration device
Means a device, used with a fall-arrest harness and lanyard, which reduces the deceleration force imposed when a fall is suddenly arrested, and correspondingly reduces the loadings on the anchorage and the person’s body. The energy absorber may either be a separate item or manufactured as part of the 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, or
- the minimum breaking load and the safe working load.

Formulas
\[ SF = \frac{BF}{SWL} \quad BF = SF \times SWL \]

(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.
Appendix B – Design Of Plant And Structures

Design Considerations
The preferred approach is always to eliminate fall hazards at the workplace. Consideration of the potential risks early in the design stage can result in the elimination or better control of such risks. Where this is not possible, one way to minimise risks at the design stage is to integrate fall prevention systems into the design.

Safety considerations at the design stage could include:
- Safe entry to and exit from any work area
- Designing permanent guard rails or other forms of edge protection (for example, parapet walls) for permanent fall prevention on roofs
- Future maintenance requirements, especially in relation to sloping building exteriors and windows, to ensure maintenance can be carried out safely
- Specifying the strength of roof members and other points to which guard rail, or anchor points for work positioning systems will be fixed
- Safer building design generally, with, for example:
  - Low-level mounting of roof vents
  - The location of air conditioning units and other roof-mounted plant, such as satellite dishes, away from edges
  - The location of air conditioning and similar plant at ground level
  - The specification of non-fragile material for the roof
  - The use of permanent safety mesh
  - Safer gutters, for example, installing large volume gutters and down pipes to minimise the need to access the roof for cleaning, locating the gutters at ground level or away from edges, or the removal of gutters altogether, with a smooth transition from the roof to the walls with the gutters at ground level.
  - Specific safety requirements for particular workers doing subsequent installation, maintenance or repair work.
- These groups include:
  - People installing and maintaining antennae and satellite dishes
  - Contractors servicing air conditioning equipment on the roof
  - Window and gutter cleaners and repairers, and
  - Designing the pre-fabrication of structures on the ground before they are lifted into position.
APPENDIX C – REFERENCES AND OTHER INFORMATION SOURCES
Australian Standards and Australian/New Zealand Standards

- AS/NZS 1576 Scaffolding series
- AS/NZS 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:1-2001 Industrial fall-arrest systems and devices—Horizontal lifeline and rail systems—Prescribed configurations for horizontal lifelines (Supplement to AS/NZS 1891.2:2001)
- 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 Portable ladders series
- AS/NZS 4142.3 Fibre ropes—Man-made fibre rope for static life rescue lines
- AS/NZS 4389 Safety mesh
- AS/NZS 4488 Industrial rope access systems series
- AS/NZS 4488.2 Industrial rope access systems—Selection, use and maintenance
- AS/NZS 4576 Guidelines for scaffolding
- AS 2550.16 Cranes—Safe Use—Mast climbing work platforms.
- AS/NZS 4994 Temporary edge protection series