CIVILSAFETY
SAFETY AND TRAINING

RIIWHS204D Work safely at heights

Learner Guide

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Contents

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Introduction

This unit covers Work Safely at Heights in the Mining Industry and includes:

- Identifying the work area requirements
- Access work area
- Conduct work tasks

Welcome

This participant guide is designed to assist the learner in completing the Unit of Competency: RIIWHS204D Work safely at heights. Statement of Attainment for the unit is issued in accordance with the National Standard and the AQF and AQTF, and will be recognised in all Australian States and Territories.

It has been written as self-paced and competency based. This means you can work through the module at your own pace. When you are competent in one section you can then move onto the next.

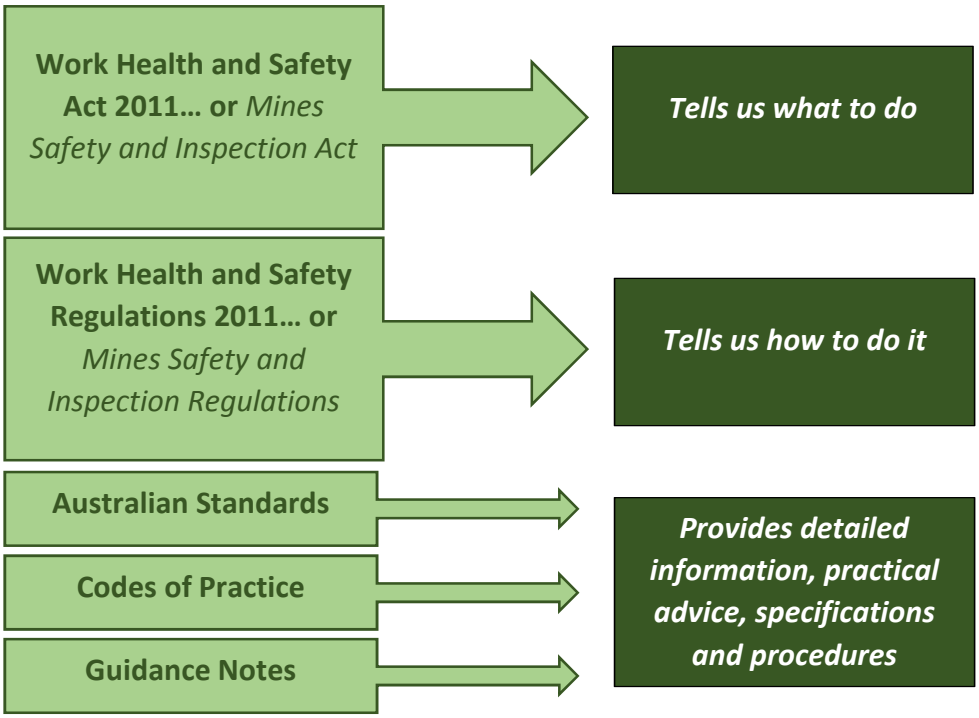
When you have completed your theory assignments and feel competent in practical work, you can arrange with your trainer for an assessment.

Upon the completion of your training, written/oral and practical assessments will be conducted. These can be further followed up through on the job evaluations, site competencies and refresher courses.

The unit of competency nominal hours is approximately 20 hours, dependent on previous experience.

Compliance Documentation

The way we work in Australia is affected and supported by a range of documents.



Currently each state and territory is responsible for developing its own laws and regulations and for enforcing those laws. Companies and organisations will normally develop their own policies and procedures based on the relevant laws and regulations. It is essential that you understand and adhere to your company's polices and safe work practices before undertaking any work.

Work Health and Safety Act 2011 provides for the promotion, coordination, administration and enforcement of Work Health and Safety. The Act has the force of the law and carries penalties for those who fail to meet their responsibilities.

Work Health and Safety Regulations 2011 in effect spells out the specific requirements of the Act. The Regulations also have the force of the law. Part 4.4 of the Work Health and Safety Regulations 2011 covers management of risk of falls.

Australian Standards are published documents setting out specifications and procedures designed to ensure products, services and systems are safe, reliable and consistently performed the way they were intended to. They establish a common language that defines quality and safety criteria. Where legislation adopts such a standard, it has the force of the law.

Codes of Practice are documents prepared for the purpose of providing practical advice on preventive strategies and practical means of achieving any code, standard, rule, provision or specification and do not have the same legal force. **For working safely at heights: Managing the Risk of Falls at Workplaces Code of Practice March 2015.**

Guidance Notes are explanatory documents providing detailed information on the requirements of matters relating to Work Health and Safety and are not admissible in Court.

To ensure the way we work is safe and achieves the outcome, other sources of information may need to be consulted. They may include the following:

- Environmental guidelines
- License and certification requirements
- Permits and internal permit control systems
- Employment and workplace relations legislation
- Equal employment opportunity and disability discrimination legislation

Specific requirements relating to working at heights will be identified throughout the participants guide and will assist in developing your understanding of working safely at heights.

Managing the Prevention of Falls in the Workplace

Employers must provide information to employees to make them aware of areas where the risk of falling may exist and to enable them to perform their work safely in these areas.

Duty of Care

An overview of the employer's duty of care is to ensure, as far as reasonably practicable, that workers and others are not exposed to risks to health or safety arising from the conduct of the employer's business.

Employers must, so far as is practicable:

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

A worker has a duty to:

- Take reasonable care for their own health and safety and for the health and safety of others while at work
- Follow reasonable directions on issues related to health and safety
- Use relevant safety equipment provided for their use
- Report workplace accidents to the employer as soon as is practicable to do so

Instruction and Training

Employers must provide proper instruction and training. This is important and should take into account the functions of each employee, to provide them with the necessary skills and knowledge to enable them to do their work safely. This includes:

- Requirements of standards and legislation
- Identification of relative hazards
- Application of the hierarchy of control and other measures to minimise and control risk
- Rescue plans and procedures
- The use, fit, inspection and maintenance of fall protection equipment
- Workers must be competently trained to identify the hazards and when required, use fall protection equipment and systems safely, to reduce or eliminate the risk of injury.

Supervision

In accordance with the Work Health and Safety Act 2011, employers must provide supervision to ensure that employees are not exposed to hazards and that they are taking reasonable care where there is a risk of falling from, through or into any place or thing.

Employers must:

- Ensure that those people in supervisory positions are competent and have the necessary skills, knowledge and authority to undertake this role
- Ensure that employees are adequately supervised when working in an elevated position
- Include sufficient monitoring of the work to ensure that agreed safe work practices are followed.

Working at Heights Definition

Working at height is defined as whenever people are at risk of falling from one level to another or being hit by falling objects (including accessing mobile equipment)

There is no minimum level where this procedure is necessary. A risk assessment will determine whether there is a fall potential. Using the hierarchy of controls will aid in identifying what protection to put in place.

Fall from Heights – Facts and Figures

- Over the eight-year period from 1 July 2003 to 30 June 2011, 232 workers were killed following a fall from a height, 11% of all workers killed over this period. In 2010–11, 29 workers died following a fall from height equating to 0.25 fatalities per 100 000 workers;
- Workers aged 45 years and over made up 70% of those who died following a fall from height. The highest fatality rate over the 2008–11 period was recorded by workers aged 65 years and over with 1.97 fatalities per 100 000 workers, nearly eight times the overall rate;
- Half of the falls that resulted in a fatality involved distances of three metres or less in the eight years 2003–11. Falls from ladders accounted for the greatest number of fatalities (37 fatalities - 16%). This was followed by falls from vehicles (27) and falls from roofs (25);
- In 2010–11, 7730 claims for serious injury were lodged due to a fall from a height. This means that 21 employees each day lodged a claim for a falls-related injury that required one or more weeks off work. Males accounted for three-quarters of the falls-related claims. A typical falls-related claim in 2010–11 involved 6.2 weeks off work, which is considerably longer than the 4.4 weeks for all serious injury claims;
- Approximately 6900 workers were hospitalised following a fall from height in the three-year period from July 2006 to June 2009. This is 9% of all workers who were hospitalised.

Source: Safework Australia

Scope of Work

Before commencing any task involving working at heights it will be necessary to identify the work requirements (i.e. confirm the scope of work required). This will involve the collection of information and instructions, and each organisation or company will have different procedures to achieve this.

In general information and instructions can be gathered from:

- Toolbox/pre-start meetings
- Maintenance requirements
- Work Requirements
- Workers involved
- Tools and equipment required, including PPE
- Priorities and the order of tasks
- Who does what job and when
- Workplace Procedures (each site is different)
- Hazard Identification and Control Methods

You will need to, in addition to confirming work instructions, ensure you have the necessary training and skills to carry out the instructions. Should you not understand the task or job, then you need to clarify with your supervisor by asking questions to confirm your work.

Communication

Using good communication skills within the construction industry is mandatory. Asking questions, clarifying information and instructions as well as using good teamwork skills (communicating, team lifts in manual handling etc.) can prevent accidents and incidents, minimise the chance of hazards and reduce any damage happening to materials, tools and equipment.

Being able to communicate effectively with a range of people from different cultural and ethnic backgrounds, and varying mental and physical abilities is vital. You can communicate so they understand by using written instructions, speaking clearly and slowly, using positive language, speaking directly – face-to-face and making eye contact.

Various ways to communicate onsite can include: radios, memos, bulletins, display boards, newsletters, checklists, emails, communication devices such as mobile phones, two-way radios – phones, face-to-face, signs and symbols, voice and hand signals, team meetings such as pre start meetings and toolbox talks.

Safety Requirements

In addition to understanding the scope of work it is essential to understand all the safety requirements that are needed to complete the designated tasks in a safe, efficient and timely manner. Safety requirements will vary from task to task and site to site although the general safety information will be based on or around the risk assessment process. Some safety documentation:

- General sources of safety information will come from:
- Federal, State and Local Statutory and Regulatory Authorities
- Australian Standards
- Material Safety Data Sheets (MSDS)
- Safe Operating Procedures (SOP) / Safe Work Method Statements (SWMS)
- Job Safety Analysis (JSA)
- Permits, such as confined space permits

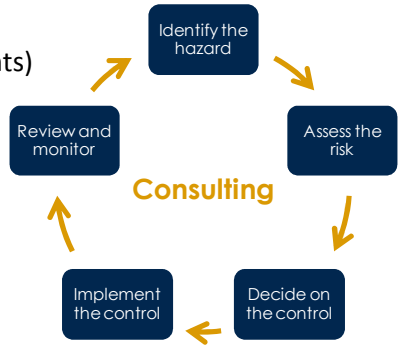
Site Inspection

Prior to commencing any work at height, and to enable the accurate completion of the risk assessment, it is necessary to determine the physical condition of the workplace, the condition of structures, access and egress from ground to work areas, prevailing weather conditions, equipment requirements (including PPE) and specific task hazards. Standard practice will be to complete a Job Safety Analysis (JSA) or follow a Safe Work Procedure (SWP).

Conducting a Risk Assessment

A Risk Assessment shall be conducted by a competent person or persons before carrying out any tasks associated with working at heights. The assessment shall be documented and take into account at least the following:

- The hazards of working at heights
- The tasks required to be conducted (including the need to work at heights)
- The range of methods by which the tasks can be conducted
- The hazards identified and risk associated with the actual method selected and equipment to be used
- Emergency response procedures
- The competence of the persons to conduct the task.



Risk Assessment Process

Identify the Hazard

A hazard means anything that may cause injury or harm to the health of a person. The following are common hazards that are associated with working at heights:

Surfaces:

- the stability;
- the fragility or brittleness;
- the slipperiness (e.g. where surfaces are wet, polished, glazed or oily in the case of new steelwork);
- the safe movement of employees where surfaces change;
- the strength or capability to support loads; and
- the slope of work surfaces (e.g. where they exceed 7o);

Levels (where levels change and employees may be exposed to a fall from one level to another);

Structures (the stability of temporary or permanent structures);

The ground (the evenness and stability of ground for safe support of scaffolding or working platform);

The raised working area (whether it is crowded or cluttered);

Scaffolding (the correct erection and dismantling);

Edges (edge protection for open edges of floors, working platforms, walkways, walls or roofs);

Hand grip (places where hand grip may be lost);

Openings or holes which will require identification or protection or **unguarded shafts or excavations**;

Proximity of employees to unsafe areas:

- where loads are placed on elevated working areas;
- when objects are below a work area, such as reo bars and star pickets;
- where work is to be carried out above workers (e.g. potential hazards from falling objects); and
- power lines near working areas;

Movement of plant or equipment (ensuring there is no sudden acceleration or deceleration);

Access to, egress from and movement around the working area (checking for obstructions);

Manual handling (checking safe work practices for carrying awkward materials, such as plaster boards and roof sheeting, which may be caught by the wind);

Lighting;

Weather conditions (when heavy rain, dew or wind are present);

Footwear and clothing (suitability for conditions);

Ladders (where and how they are being used); and

Young, new or inexperienced employees (i.e. employees unfamiliar with a task).

All identified hazards must be managed and reported to the relevant personnel.

Assess the Risk

Following the identification of the hazards, the next step is to ensure a risk assessment is conducted. Risk assessments must be conducted by a competent person and documented correctly.

RISK = the probability and consequence of injury, harm or loss occurring from a hazard

Risk may be ranked as low, medium, high or extreme (depending on the type of matrix used). A sample risk matrix is shown below and right:

H = High Risk
M = Medium Risk
L = Low Risk

PROBABILITY	CONSEQUENCE A	B	C	D	E
1	H	H	H	M	M
2	H	H	M	M	L
3	H	M	M	L	L
4	M	M	L	L	L
5	M	L	L	L	L

Decide and Implement Controls

PROBABILITY (chance hazard may happen)			CONSEQUENCE (outcome if hazard did happen)		
LEVEL	DESCRIPTOR	DESCRIPTION	LEVEL	DESCRIPTOR	DESCRIPTION
1	Expected	The event is expected to occur in most circumstances	A	Major	Death, major environmental impact, area/plant evacuation/shutdown
2	Often	The event will probably occur in most circumstances	B	Significant	Long term health effects, environmental incident with no long term effect, permanent disability, loss of production
3	Sometimes	The event should occur at some time	C	Moderate	Lost time injury, environmental incident contained and cleaned up on site, uncontrolled exposure to hazardous substances
4	Rarely	The event could occur at some time	D	Minor	Medical treatment, environmental incident involving minor spill, short term health effects
5	Unlikely	The event may occur only in exceptional circumstances	E	Insignificant	First Aid Treatment

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

The hierarchy of Control

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of control. The term hierarchy of control is commonly used in OHS risk management practice as it prescribes a preferred order of risk controls. These are described below in order of priority.

Elimination

Removing the hazard or hazardous work practice from the workplace (e.g. eliminating the need to access the fall risk area such as by installing air conditioning units in the centre of the roof).

Substitution

Substituting or replacing a hazard or hazardous work practice with a less hazardous one (e.g. providing an alternative means of access such as a safe walkway so the risks of falls are avoided; or installing an elevating work platform for work at heights).

Isolation

Isolating or separating the hazard or hazardous work practice from people involved in the work or people in the general work areas (e.g. barricading or enclosing the fall risk area with edge protection, installing handrails and covering floor penetrations).

Engineering

If the hazard cannot be eliminated, substituted or isolated, an engineering control is the next preferred measure. This includes the use of a fall injury prevention system designed to restrain or arrest a person's fall from one level to another and minimise the risk of injury or harm to a person if they fall (e.g. a restraint system or fall-arrest system, catch platforms, safety nets and safety mesh). It may also include modifications to plant or providing guarding to machinery and equipment.

Administration

Administrative controls include the implementation of procedures and guidelines, personal behaviours, training, licensing, etc.

Personal Protective Equipment (PPE)

PPE is often the last barrier between a person and a hazard. PPE is used or worn to ensure people do not come into direct contact with a hazard. Examples of control measures include:

- designing, planning and modifying plant, buildings and structures to prevent falls;
- looking at the way jobs can be done safely to eliminate or reduce the likelihood of a fall (e.g. checking that ladders are safe and used correctly);
- organising and sequencing work so that people do not interfere with or increase the risk of a fall for themselves or others;
- identification, collection and presentation of information and knowledge required by employees and contractors to enable them to work safely;
- identifying the training required to work safely if there is the risk of a fall; and
- identifying areas requiring non-slip surfaces for stairs or ladders.

Review and Monitor

Deciding on and implementing a risk control measure is not the end of the risk management process. It is important to constantly monitor and review control measures and fall equipment to ensure that they continue to prevent or control exposure to hazards or hazardous work practices, especially if the scope of the work changes, or job conditions change. In undertaking the review, consult workers involved in the work and their work health and safety representatives and consider the following questions:

- Are the control measures working effectively in both their design and operation?
- How effective is the risk assessment process? Are all hazards being identified?
- Are workers actively involved in the risk management process? Are they openly raising health and safety concerns and reporting problems promptly?
- Have new work methods or new equipment made the job safer?
- Are safety procedures being followed?
- Has instruction and training provided to workers been successful?
- If new legislation or new information becomes available, does it indicate current controls may no longer be the most effective?
- Is any change planned to any plant or structure that may create a change to the work process?
- Has an incident occurred as a result of work carried out?

If problems are found, go back to any point in the risk management process, review the information and revise any decisions about controls measures.

Consulting and Reporting

To ensure the validity of the risk assessment process and to promote the effectiveness of risk control, it is important to consult with:

- Industry experts where applicable
- Supervisors
- People involved in the work
- Other work team(s) who may be working in or around the area
- Any other stakeholders

Safety Systems while Working at Heights

Depending on the tasks required when working at heights, a range of safety systems should be in place to reduce exposure to hazards. This may include:

- Fall arrest and fall restraint systems
- Access equipment
- Perimeter protection equipment

Access Equipment

Access equipment are devices specially designed to help users reach various heights, as well as awkward or hard to reach areas, quickly and safely. Correct use of this equipment may reduce the exposure of personnel to falls from heights.

Signs and Barricades

Signs and safety barriers should be installed to help reduce the risks from falling objects or when elevated working platforms or ladders are being used. They can also be used to notify all personnel and the public of work at heights taking place. Signage and barricades may include:

- Site safety signage, e.g. temporary warning signs, guide signs.
- Devices, e.g. flashing lights, hazard markers, message boards.
- Temporary signage for the benefit of motorists and pedestrians, e.g. traffic and regulatory cones, portable traffic lights and signals, vehicle mounted signs, signals and directions.
- Barricades and fences, e.g. barrier boards, bollards, concrete barriers

Fixed Work Platforms

Work platforms provide a permanent or temporary surface for people to carry out work.

The platform should be secured against a structure for stability and be installed with an edge protection system. The surface 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. The surface should be non-slip, free from trip hazards and traps and of an easily negotiable gradient. Safe access and egress must be provided to the work platform.

The appropriate reference standards for a fixed platform are:

- AS 1657-2013 Fixed platforms, walkways, stairways and ladders - Design, construction and installation and for temporary platforms
- AS/NZS 1576 - 2010 Scaffolding
- AS/NZS 4576 – 1995 Guidelines for scaffolding

Elevating Work Platforms

Elevating work platforms (EWPs) are available in a variety of types and sizes for most work situations. They are generally of the boom type, scissor lifts and vertical mast. Operators working on a boom type EWP must wear a full body safety harness and anchor fall protection. The harness must be correctly fitted by authorized personnel.

The harness must arrest the fall before the user strikes the ground.

When working from EWP:

- Wear your safety harness correctly and secure your lanyard to the anchor point.
- Do not tie off to any adjacent structure.
- Do not exit the machine at height - it is not a replacement for a ladder or scaffold.
- If there is a company approved SWP for exiting a work platform from heights, double legged lanyards **must be** used and a risk assessment must be conducted.

NOTE:

For scissor lifts, wearing of safety harnesses is generally not required, but should be subject to a risk assessment.

Scaffolding

Scaffolds are erected to provide a temporary work platform for undertaking a variety of tasks. Working platforms on scaffolds are generally rated as light, medium or heavy duty.

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

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

'Heavy duty scaffolding' is scaffolding of up to 675 kg per bay. This is needed for bricklaying, concreting, demolition and most work tasks involving heavy loads or heavy impact forces. Platforms should be at least five planks (approximately 1100 mm) wide.

The safety requirements and considerations for use of scaffolding include:

- if scaffolding is to be erected or dismantled at a height exceeding four (4) metres, then it must be erected or dismantled by a certified scaffolder;
- a person must not alter scaffolding without authority from the main contractor;
- mobile tower frame scaffolds can be used to provide safe working platforms;
- scaffolding that is incomplete and left unattended should have danger tags and warning signs attached at appropriate locations to prevent use;
- scaffolding exceeding four metres in height should be inspected and tagged by a competent person before use, after any alteration or repair, and at intervals not greater than 30 days;
- safe access to and egress from the scaffold must be provided; and...
- edge protection (guard rails and toe boards) must be provided at every open edge of a work platform.

Forklift Work Platforms

These are used to elevate personnel for various working activities, using the lifting ability of a forklift 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 forklift elevating system. Standing on the forklift tynes, on pallets or in unsuitable stillage's (pallet with a cage), are common causes of falls from height.

The safety requirements and considerations for use of forklift work platforms include:

- Forklift operators must be assessed as competent by a registered assessor or have proof of training/experience.
- The work platform must be secured to the forklift.
- The operator of the forklift must remain seated at the controls of the forklift at all times while personnel are elevated in the work platform.
- No more than two people at once are to be lifted in a work platform.
- Personnel must remain in the work platform during raising or lowering and must not be moved from place to place other than for small positional adjustments.
- The load capacity of the platform must not exceed 250 kg (unless the type and design of the forklift is manufactured in accordance with AS 2359:1995 Powered industrial trucks and the appropriate hazard identification and risk assessment has been done).
- If the work platform has an anchor point then a suitable fall restraint system must be used.

Work Boxes

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

The safety requirements and considerations for use of a work box include:

- the work box should not be suspended over persons;
- workers should not enter or leave the workbox when it is elevated unless a risk assessment is conducted (except in an emergency);
- a suitable fall restraint system must be used inside cage at all times;
- the crane is suitably stabilised at all times while the work box is used;
- an effective means of communication between any person in the work box and the operator, is provided;
- the lift must be controlled by a licensed competent dogman/rigger; and...
- the operator must remain at the controls of the crane at all times.

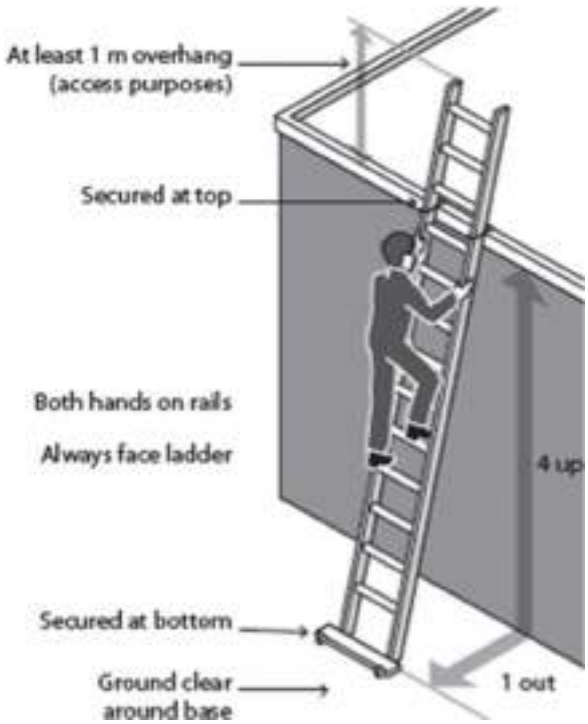
Ladders

Ladders are primarily a means of access and egress. Many falls take place when people are working from ladders. In addition, when using a ladder:

- the working width and movement is limited
- the time involved in moving and setting up ladders is often underestimated when planning work
- the working position on ladders is often uncomfortable (the need to stretch sideways, work above shoulder height and stand on narrow rungs for a long time) and may cause musculoskeletal disorders.

For these reasons, you should consider whether an elevating work platform or scaffolding would be safer and more efficient.

Portable Ladders



Portable ladders should be used as a means of access to or egress from a work area and not used as a platform.

Part 6.3, Subdivision 3 Ladders and platforms supported by ladders of the WHSR 2011 states that if at a workplace, a person uses either a single or extension ladder, then the person must ensure that the ladder*:*

- Is placed so that the distance from the ladder base to the base of the support wall is about ¼ of the working length of the ladder
- Is located on a firm footing, at least 2 hands and 1 foot, or 2 feet and 1 hand.
- Is secured into position so as to prevent slipping and sideways movement
- If being used to approach a working platform, protrudes at least 1m beyond the landing for the working platform.

In addition, when using a portable ladder, consideration should be given to:

- Choosing the type of ladder appropriate to the task (all portable ladders must comply with the appropriate Australian Standard)
- Wearing slip resistant shoes
- When a person is stepping from the ladder, ensure that they have a firm and level work platform, free from obstructions to step onto
- Ensuring the ladder is not too close or too far from the support structure. The ratio is 1 – 4 (e.g. the distance between the ladder base and the supporting structure should be about 1m for every 4m of working ladder height)
- Securing the ladder against displacement or having another person hold the base of the ladder
- Making sure all locking devices on the ladder are secure
- Using a fall arrest system if there is likelihood of a free fall
- Ensuring that metal or wire bound ladders are never used close to energised power lines
- Ensuring the ladder is in good condition

Fixed Ladders

Fixed ladders are vertical or near vertical ladders fixed to a structure. Rung ladders should have ladder cages or persons using the ladder should use fall-arrest systems. A ladder cage or fall-arrest system must be provided if a person can fall more than 6m.

Perimeter Protection

Physical barriers are the preferred method of preventing a person from falling from height and are a method of isolation. Examples of physical barriers include:

- edge protection systems
- fall protection covers

Edge Protection Systems

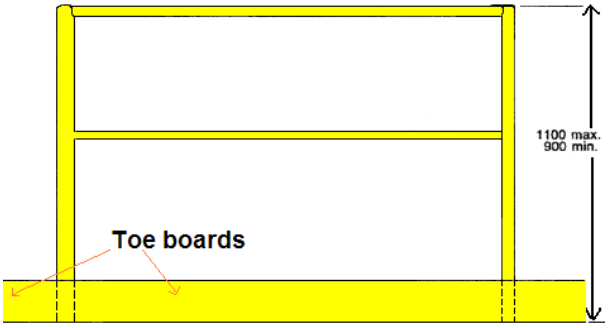
Edge protection systems are barriers erected around the edge of a building, structure or hole. Edge protection should consist of guard rails, solid balustrades or other structural components, for example wire mesh supported by posts and provided with a reinforced top edge.

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
- around openings in floor and roof structures
- at the edges of shafts, pits and other excavations

Permanent guard rails should incorporate a top rail 900mm to 1100mm 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.



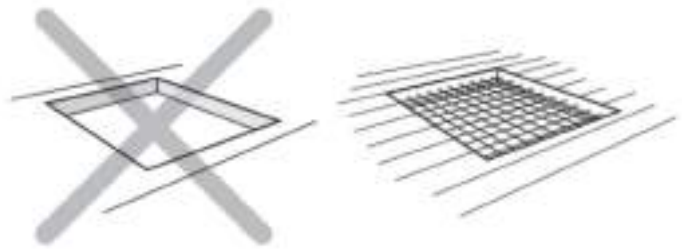
Fall Protection Covers

Holes, penetrations and openings through which a person could fall should be made safe immediately after being formed. Fall protection covers are a protective structure placed over holes and openings to prevent falls.

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

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.



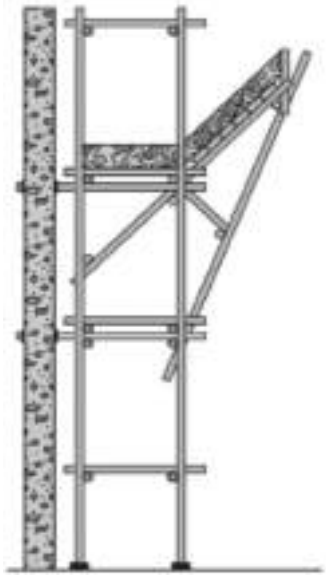
Holes or openings covered with wire mesh should not be used as a working platform. All covers should be securely fixed around the hole.

Signs should also be attached to the cover to warn people that there is a hole underneath.

Other Fall Protection System

Catch platforms and safety nets should only be used where it is not possible to provide any more reliable means of fall protection such as physical barriers or personal protection systems.

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.

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.

Safety Nets

Safety nets can provide a satisfactory means of protection while allowing workers maximum freedom of movement. A safety net must be installed as close as possible to the underside of the work area, but not in contact with the surface. 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 object;
- 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; and
- safety nets are stored correctly in dry, shaded areas with good air circulation.

Use of Tools and Equipment at Height

There is a significant possibility of dropped tools and objects any time whilst handling tools at height. Dropped tools can do harm to people, damage to machinery as well as generate costs associated with lost production time.

Some typical examples of the consequences associated with dropping tools and objects shows the likely-hood of injuries or even death from falling objects, relative to the mass as well as height from which a drop occurs:

- A bolt dropped from 23 metres is equivalent to being dropped from the 6th floor of a building. The actual speed attained is 80kph on impact. The bolt achieves a mass impact weight of 49.5kgs at this time, potentially resulting in a fatal injury, even though struck on the head whilst wearing a hard hat.
- A screwdriver dropped from 14 metres is equivalent to being dropped from the 4th floor of a building. The velocity attained is 61kph on impact. The screwdriver achieves a mass impact weight of 73.5kgs at this time, potentially causing a fatal injury, even though hit on the head whilst wearing a hard hat.
- A claw hammer dropped from 6 metres is equivalent to being dropped from the 2nd floor of a building. The speed attained is 39kph on impact. The claw hammer achieves a mass impact weight of 117kgs at this point, potentially resulting in a fatal injury, even if struck on the head whilst wearing a hard hat.

This is a guide only and in reality, even a light-weight object dropped from a significant height may well turn out to be fatal.

Before beginning any type of task, think about the possibility of dropped tools and objects:

- Do not carry materials and tools by hand when climbing.
- Any tools used at height must be anchored against falling (lanyards, tethers, etc.).
- Wrist straps must only be put into use if they give protection against injury due to de-gloving.
- Put in place barriers under the work area and make sure the actual extent of the barrier area is appropriate to the work being done at height.

Personal Fall Protection

Introduction

Systems of work and equipment that secure a person to a building or structure are known as personal fall protection. Personal fall protection systems should be used to minimise the risk of:

- a person falling from a height (fall restraint system)
- injury to a person after they have fallen from height (fall-arrest system).

Personal fall protection may be required to be used in conjunction with other fall protection systems. The use of these systems requires appropriate training to ensure the equipment is worn, attached and used in the correct way

Fall Restraint vs. Fall Arrest

Fall restraint and fall arrest are not interchangeable terms. They are two very different and separate categories in the fall protection area of safety. Basically, a fall restraint system prevents workers from reaching a hazard, while a fall arrest system allows workers to reach a hazard and then protects them if they should fall.

Review the images below, and decide whether the protection pictured is fall restraint or fall arrest:

Fall Restraint Systems

A fall restraint system (also known as a travel restraint system) controls a person's movement by physically preventing the person reaching a position at which there is a risk of a fall. This type of personal fall protection system is preferred over those that arrest a person after they have fallen.

Generally, the system consists of a safety belt or harness that is connected by a lanyard to a suitable anchorage point or static line. The system must be set up to prevent the wearer from reaching the edge. Fall protection equipment and materials should be checked periodically throughout tasks to check and cater for compliance, any unnecessary or uncontrolled movement and to make sure it is always safely secured.

Where a temporary roof anchor is used as an anchorage for a travel restraint system, it must be installed in accordance with the manufacturer's or designer's instructions. The roof or other building component to which an anchor will be attached must be checked by a competent person to verify that it is suitable for supporting the anchor. The anchorage points must be capable of taking the load. Refer to AS/NZS 1891.2 Industrial fall-arrest systems and devices - Horizontal lifeline and rail systems for the anchorage force required.

It is preferable that travel restraint systems are used in conjunction with other fall prevention methods, such as guardrails, safety nets and catch platforms.

Restraint System Set-up and Use

Generally, the system consists of a safety belt or harness that is connected by a lanyard to a suitable anchorage point or static line. The system must be set up to prevent the wearer from reaching the edge.

A restraint system is suitable for use where:

- the user can maintain secure footing without having to tension the restraint line and without the aid of any other 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 series.

Use of a Fall Arrest System instead of a Restraint System

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

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

An important factor in the safe use of a fall-arrest system is to reduce the free fall distance as far as possible. Correctly installed fall-arrest equipment will only safely arrest a fall if there are no obstructions in the fall path. The longer the free fall distance, the greater the risk of the person hitting obstructions.

Before a fall-arrest system is used, the work area should be inspected to ensure there are no obstructions in the potential fall path.

Any obstruction should be removed from the fall path area.

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

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

The A B C D E of Fall Protection

The A, B, C, D, E of fall protection covers the fundamental requirements of every personal fall protection system.

Anchorage	Anchorage provides a secure point of attachment (to an existing structure) for the fall arrest system. Anchorage devices can be permanent or temporary and vary to suit the type of structure available.
Body Harness	Full body harnesses connect the worker to the fall arrest system. They are specially designed to protect the worker against serious injury in the event of a fall whilst also remaining comfortable to wear.
Connectors	Connectors are devices that connect the full body harness to the anchorage system. They can be single products or multiple devices working together.
Deceleration	A decelerator is fitted between the anchor point and the full body harness. This device must limit the forces on the body to a maximum of 6kN in the event of a fall. Decelerators are built into many self-retracting lifelines and take the form of tear webbing absorbers in lanyards.
Emergency Rescue Plan	Steps A, B, C and D reduce the chance of a fall, however once a fall occurs, it is equally important to deal with the next potential hazard - suspension trauma. To avoid this potentially lethal condition, it is important to be rescued within 15 minutes of the fall. Have a rescue plan in place that allows escape in a much shorter time and practice rescue techniques regularly.

Anchorage

Anchorage means an anchor point for a fall injury prevention system (i.e. the means for attaching a lanyard, lifeline or other components of the system to a secure point).

It's important to remember that fall protection is only as good as its anchorage. It doesn't matter how well trained personnel are, how good the equipment is, or whether or not the employee tied off correctly. If the anchor point fails nothing in the system will work.

Anchor points 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.

Selection of Anchor Points

All anchor points for personal fall arrest and positioning systems must meet minimum structural requirements.

Section 3 of *AS 1891.4, Industrial fall arrest systems and devices - Selection, use and maintenance,* states that single point anchors for fall arrest systems to be used by one person should be designed for a load of 15kN (1500kg). If two people are likely to use the same anchor point at the same time it must be capable of withstanding a load of 21kN (2100kg).

The Standard further states that more than two people are not permitted to use the same anchor point at the same time. However, more than two people may use a horizontal lifeline at the same time, if this is within the manufacturer's specifications.

Anchor points can vary from single points to straps around suitable beams or to the more sophisticated static line. They can also be on davit arms or tripods for confined space and rescue work.

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).

Permanent handrails or part thereof, including EWP & scissor lifts, are **not** acceptable anchor points.

Static Lines

Static lines are horizontal lifelines, generally constructed from steel wire rope, to which lanyards are usually connected.

Important points to consider when using a static line include:

- length of the system (maximum 100m)
- length between immediate supports (maximum 10m)
- number of people hooked on
- length of lanyard of the user
- distance below the user (= height of person + sag factor + length of lanyard + length of shock absorber once deployed)

Inspection of Anchor Points

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

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

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

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

All anchorages should be visibly checked by the user prior to use.

Permanent vs. Temporary Anchor Points

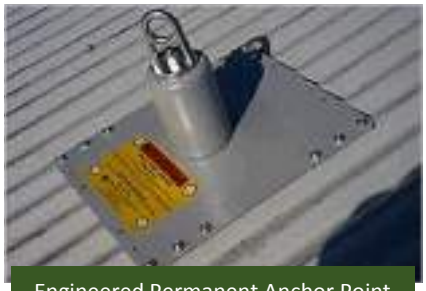
The minimum structural requirements for permanent and temporary anchorage points are identical. The key issue to remember, whether permanent or temporary, is that the anchor point should not degrade over the expected lifetime. All anchor points must be designed to maintain the minimum strength required over their lifetime.

Temporary Roof Anchor

Beam Clamp

Beam Strap

Engineered Permanent Static Line



Engineered Permanent Anchor Point

Body Harness

A full body safety harness is a key part of an active fall arrest system. The harness serves two purposes, first, distributing fall forces safely across a worker's body in the event of a free fall, and second, providing freedom of movement sufficient to allow the worker to effectively perform his or her job. When properly used, the full body design contains the human torso and aids in keeping it upright during a fall event. A full body harness must be work when working in an elevated work platform.

Key components of a harness

Full body safety harnesses are manufactured from different types of fabric webbing that are sewn together to into various configurations or straps. Common harness webbing fabrics include nylon and polyester. Specialty fabrics like Kevlar are used for harnesses used in hazardous applications like welding and arc flash environments.

The harness straps are tightened to the body by buckles. Common harness buckles include tongue, mating and quick connect. A standard full body harness has straps and buckles that tighten around the shoulders, legs, and chest.

Full body safety harnesses are also designed with one or more attachment points. The attachment point can be a critical fall arrest system link like a back D-ring, or it can be a keeper for a lanyard that's not in use. Attachment points are sewn into the harness webbing and can be made of stamped or forged metal, or plastic. The location of the attachment point is dependent upon the type of harness and what application it will be used in.

Tongue Buckle

Mating Buckle

Quick Connect Buckle

Standard fall arrest harnesses provide a single D-ring attachment on the back.

This allows for attachment of a fall arrest lanyard, and helps to keep the body upright during a fall event. Harnesses used in work positioning are designed with side D-rings which allow for easy attachment of positioning lanyards.

Harnesses used in vertical fall protection systems allow for a guided fall arrester to be connected to a front D-ring. Some harnesses also have shoulder d-rings or webbed attachment points which are primarily used for lifting and lowering individuals, such as in confined space and rescue applications.

Back D-Ring

Side D-Rings

Front D-Ring

Shoulder D-Rings

Weight Restrictions

It is important to note that fall arrest equipment certified under Australian and New Zealand standards are rated for use by personnel up to **136kg**. Harnesses can be made to fit a person greater than a "large" size, however the weight limit for that person **must not exceed 136kg** including tools and equipment. Most harnesses and lanyards are designed and tested for a maximum weight limit of **136kg** and therefore product performance beyond this limit is unknown.

In cases where the user exceeds the weight limit of **136kg**, some equipment providers are able to supply a harness for users up to 160kg (including tools and equipment), however a "Certificate of Conformance" must be provided with the harness at the time of purchase.

Source: SAFERIGHT – HEIGHT SAFETY EQUIPMENT

Inspection of Harness

Before starting any job, the harness requires inspection to ensure safety. To inspect your harness, perform the following steps:

1) Webbing/Stitching

Grasp the webbing with your hands 6 inches (152mm) to 8 inches (203mm) apart. Bend the webbing in an inverted "U" as shown. The surface tension resulting makes damaged fibres or cuts easier to detect. Follow this procedure the entire length of the webbing, inspecting both sides of each strap. Look for frayed edges, broken fibres, pulled stitches, cuts, burns and chemical damage.

2) D-Rings/Back Pads

Check D-rings for distortion, cracks, breaks, and rough or sharp edges. The D-ring should pivot freely. Inspect for any unusual wear, frayed or cut fibres, or broken stitching of the D-ring attachments. Pads should also be inspected for cracks, excessive wear, or other signs of damage.

3) Buckles

Inspect for any unusual wear, frayed or cut fibres, or broken stitching of the buckle attachments.

4) Tongue Buckles

Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. Roller should turn freely on frame. Check for distortion or sharp edges. Inspect for loose, distorted or broken grommets. Webbing should not have additional punched holes.

5) Mating Buckles

Inspect the buckle for distortion. The outer bars and centre bars must be straight. Pay special attention to corners and attachment points at the centre bar.

6) Quick-Connect Buckles

Inspect the buckle for distortion. The outer bars and centre bars must be straight. Make sure dual-tab release mechanism is free of debris and engages properly.

7) Tagging System

Every harness must have a legible tag identifying the harness, model, and date of manufacture, name of manufacturer, limitations and warnings. Check tag for date of manufacture and remove from service if past adopted service life policy. Harnesses have a life of 10 years from date of manufacture. If tagging system is missing or not legible remove harness from service.

Some harnesses on the market also have an impact indicator that allows the user to quickly and easily inspect the harness for impact loading (i.e. has the harness been subjected to a fall). Some examples are shown below:

D-Ring Pad Impact Indicator

Rip Stitch Indicator

Exposed Impact Indicator

How to put on a Harness

Step 1

Hold harness by back D-ring. Shake harness to allow all straps to fall in place.

Step 2

If chest, leg and/or waist straps are buckled, release straps and unbuckle at this time.

Step 3

Slip straps over shoulders so D-ring is located in middle of back between shoulder blades.

Step 4

Pull leg strap between legs and connect to opposite end. Repeat with second leg strap. If belted harness, connect waist strap after leg straps.

Step 5

Connect chest strap and position in mid-chest area. Tighten to keep shoulder straps taut.

Step 6

After all straps have been buckled, tighten all buckles so that harness fits snug but allows full range of movement. Pass excess strap through loop keepers.

With a correctly fitted harness you should:

- be able to reach the rear D-ring
- insert a fist through the waist strap (if applicable)
- insert a flat hand through the leg strap

A harness that is too loose or incorrectly fitted can result in severe injury to the groin/genital area.

Harness and Hot Work

Hot work at heights has to be carefully planned and prepared for. Specially designed harnesses suitable for use in environments where hot sparks or molten materials may come into contact with the equipment should be used wherever possible.

If welding or an allied process is being done at a workplace where a fall injury prevention system is in operation then a person who, at the workplace, is an employer, the main contractor or a self-employed person must ensure that:

- a person using the system is protected from hot particles or sparks resulting from the welding or allied process; and
- the system is protected from hot particles or sparks resulting from the welding or allied process.

Connectors

Connectors are devices that connect the full body harness to the anchorage system. They can be single products or multiple devices working together.

Lanyards

A safety harness lanyard is the lifeline that connects the safety harness to the anchor point and assists in the attempt to keep a person from hitting the ground if a fall should occur.

- A lanyard is designed to bring an employee to a complete stop when falling.
- While working, every employee should be secured with an individual lanyard.
- All lanyards **must** incorporate a shock absorber.

There are various types of lanyards available on the market, made from different types of material:

Webbing Lanyards

Fixed Length Lanyard

Adjustable Lanyard

Self-Retracting Lanyard

Twin Tailed Lanyard

Elasticated Lanyard

Twin Tailed Elasticated Lanyard

Rope Lanyards

Fixed Length Rope Lanyard

Adjustable Rope Lanyard

Twin Tailed Rope Lanyard

Wire Lanyards

Fixed Length Wire Lanyard

Twin Tailed Wire Lanyard

Lanyards can have:

- double or triple action karabiners at either end
- double action hooks at both ends
- or double-action “scaff hooks” at the anchor end

Triple Action Karabiner

Double Action Hook

Double Action Scaffold Hook

Inspection of Lanyards

Before starting any job, the lanyard requires inspection to ensure safety. If you notice that a harness or lanyard has damage, you must tag it out and report it to your supervisor. To inspect your lanyard, perform the following steps:

1) Hardware

Inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The gate (latch) should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening when the keeper closes.

2) Web Lanyard

While bending webbing over a pipe or mandrel, observe each side of the webbed lanyard. This will reveal any cuts, snags or breaks. Swelling, discoloration, cracks and charring are obvious signs of chemical or heat damage. Observe closely for any breaks in stitching. Inspect lanyard warning flag for signs of activation. Titan tubular lanyards must be measured to determine activation.

3) Rope Lanyard

Rotate the rope lanyard while inspecting from end-to-end for any fuzzy, worn, broken or cut fibres. Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in period.

4) Wire Rope Lanyard

Always wear gloves when inspecting a wire rope lanyard; broken strands can cause injury. While rotating the wire rope lanyard, watch for cuts, frayed areas or unusual wearing patterns on the wire. Broken strands will separate from the body of the lanyard.

5) Shock Absorber Pack

The outer portion of the pack should be examined for burn holes and tears. Stitching on areas where the pack is sewn to D-rings, belts or lanyards should be examined for loose strands, rips, deterioration or other signs of activation. According to WHS requirements and Manufacturer's Specifications, all lanyards must incorporate a shock absorber.

6) Tagging System

Every lanyard must have a legible tag identifying the lanyard, model, and date of manufacture, name of manufacturer, limitations and warnings. Check tag for date of manufacture and remove from service if past adopted service life policy. Lanyards have a life of 10 years from date of manufacture. If tagging system is missing or not legible remove lanyard from service.

Karabiners

All karabiners must be double or triple action lock types. Karabiners that fall into the above category would include screw gate and twist lock (auto-lock) karabiners.

Clip gate karabiners used for rock climbing **must** not be used for working at heights.

When using double action karabiner you must ensure:

- the gate is screwed closed
- the screw points downwards

Double Action (Screwgate) Karabiner

Triple Action Karabiner

Rope Grabs

Rope grabs allow travel along a vertical lifeline while providing stoppage in the event of a fall; the mechanism automatically locks on the rope when weight is suddenly applied to the device. They are easily adjustable to ensure you remain within the established safe working zone for the task.

The grabs are available in two different styles:

- **Manual –** the worker manually slides the device to the desired position on the rope and releases it, locking it on the lifeline and providing the worker with fall protection. Great for sloped roofs because they lock in place once positioned.
- **Automatic –** the automatic rope grab allows a worker to move up and down freely and can be attached/detached at any point onto the anchorage line. In the event of a fall it will automatically lock onto the rope and stop the fall.

Manual Rope Grab

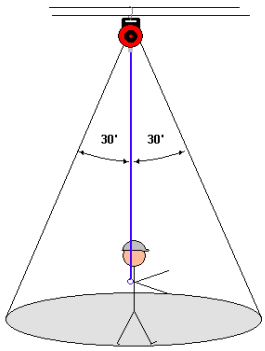
Automatic Rope Grab

Inertia Reels

Inertia reels (also known as self-retracting lifelines) are designed to arrest your fall in a free fall situation. For an inertia reel to work correctly it must be mounted above you to prevent the pendulum effect encountered during a fall.

Prior to using an inertia reel, you must consider the following:

- must only be used in a fall arrest situation (not for fall restraint)
- must be mounted above the user
- must be used vertically and must not be locked off or leaned on
- are only effective in a 30 degree arc
- NEVER use two inertia units connected together
- NEVER use a lanyard together with an inertia reel
- must be dismantled and inspected every 12 months



Inertia reels are also available with recovery capabilities that allow for emergency lifting and lowering, rescue and work positioning applications.

Inertia reels utilise an inertia brake system that minimises free fall by locking off immediately in the event of a fall. Therefore, a personal shock absorber is not required.

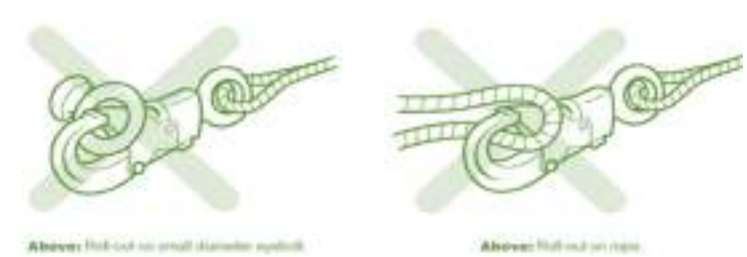
Compatibility of Components

A fall arrest system must comprise of components that are compatible with one another. For example, when using connectors, there must be low risk of any of the following occurring that results in the connection being released:

- loading of the gate on a connector resulting in roll-out
- loading of a connector in such a way that the locking devices can be inadvertently released resulting in disconnection
- lack of free movement between components resulting in jamming leading to unintentional loading

Deceleration

A deceleration device (also known as a shock absorber) is a mechanism that dissipates or reduces the substantial amount of energy imposed on a person during a fall arrest.



How does a Shock Absorber work?

A shock absorber is designed to unzip gradually at the end of the lanyard in the event of a fall, so the force of coming to a stop never exceeds 6kN (equivalent to 600 kg), which is regarded as a safe limit.

The shock absorber will start to deploy at 2kN (200kg) and will extend to a length of up to 1.75m.

A 100kg person who is jerked to a stop after falling 2 metres generates a force on a lanyard without a shock absorber approximately equivalent to a 1500kg mass. If there is no shock absorber this will either cause a severe injury or cause the lanyard or harness to fail resulting in severe injury.

All lanyards **must** incorporate a shock absorber, regardless of whether they are used for fall restraint or fall arrest.

Emergency Rescue Plan

Steps A, B, C and D reduce the chance of a fall, however once a fall occurs, it is equally important to deal with the next potential hazard - suspension intolerance (also known as suspension trauma).

Any job that requires personnel to work at heights and/or there is a risk of falling, requires that the hazards are identified and assessed and control measures identified and agreed by the personnel involved. This must also include rescue planning.

The best rescue plans are basic and easy for most people to apply. Items like a chain block, with a sling or a rope, and a loop tied in the end of it lowered to the person, could be all that's needed to prevent the onset of suspension trauma.

Use the correct rescue equipment only if you have been trained to use it. Remember if you nominate equipment in your rescue plan, it needs to be on the job ready to use and accessible while the task is being performed.

Rescue 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.

The emergency procedures for falls may be incorporated into the emergency plan required for the workplace under the WHS Regulations.

When establishing emergency procedures, you should take into account the following:

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? What is the likely response time?

Rescue Equipment

There are several types of fall rescue kits available on the market. The kits are designed to be a complete rescue system in a bag. Able to be operated by one person, are quick and easy to use, and you can raise or lower the victim.

If you can safely access the anchor point that the fallen worker is attached to, the kit enables a rescuer to:

- Attach a casualty who is suspended by a fall arrest lanyard
- Raise casualty in order to release their current attachment
- Raise or lower the casualty to a point of safety

Suspension Intolerance

Suspension intolerance (also known as 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.

The symptoms of suspension intolerance include:

- hot flushes, sweating, anxiety, numbness
- rapid pulse and breathing
- sudden loss of consciousness (fainting)
- death within 10 – 30 minutes if not rescued

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 intolerance and act quickly in the rescue of a person.

To prevent suspension intolerance occurring as a result of an arrested fall, you should ensure that:

- workers never work alone when using a harness as fall protection
- workers use a 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.

Actions after a Fall

Rescue procedures should include the following contingency based actions:

- If self-rescue is impossible, or if rescue cannot be performed promptly, the worker should be trained to "pump" his/her legs frequently to activate the muscles and reduce the risk of venous pooling. Footholds straps as discussed above can be used to alleviate pressure, delay symptoms, and provide support for "muscle pumping."
- Continuous monitoring of the suspended worker for signs and symptoms of suspension intolerance.
- If the worker is unconscious, keeping the worker's air passages open and obtain first aid.
- Monitor the worker after rescue, and ensure the worker is evaluated by a health-care professional. The worker should be hospitalised when appropriate. Possible delayed effects, such as kidney failure, which is not unusual in these cases, are difficult to assess on the scene.

Reflow Syndrome

Reflow Syndrome is a potentially fatal condition that can occur after blood pools in a part of the body (typically the legs) for a prolonged period, such as during suspension trauma. Toxins build up in the pooled blood, and when it returns to the body (for instance, when the patient is allowed to lie down), serious problems or death can occur.

Pooled blood in the legs is 'stale' after 10-20 minutes as it is:

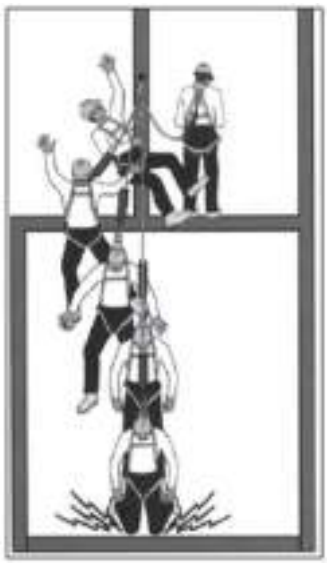
- Drained of oxygen, saturated with CO^2
- Loaded with toxic wastes (from the fat burning process)

If the patient is laid flat or allowed to lie down, the blood will suddenly rush back to the body, and the toxins, as well as the lack of oxygen, can cause cardiac arrest and severe damage to the liver, kidneys, and brain.

The most important treatment for reflow syndrome is to prevent it in the first place by **not** allowing the patient to lie down, even for a moment, following suspension intolerance or any other situation where blood has pooled in the legs for an extended period of time.

Instead, the patient should be placed in a seated position, with the thighs horizontal, so that the blood can gradually return to the body. The patient should remain in a seated position for **30 minutes** following release from suspension, regardless of whether they are conscious or not.

The only exception to this is if cardiac arrest occurs, in which case it will be necessary to lay them down to perform CPR.



Fall Arrest Planning

Before deciding on a fall-arrest system, assess the hazards a worker may be exposed to in case of a fall. Consider the following important points:

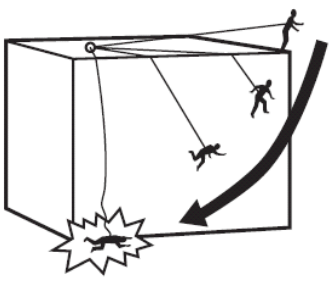
- Before the fall is arrested, will the worker "bottom out," that is, hit ground, material, equipment, or a lower level of the structure?
- Will the pendulum effect cause the worker to swing from side to side, possibly striking equipment, material, or structure?
- In the event of fall arrest, how will the suspended worker be rescued?

Planning must take into account these and other concerns.

Bottoming Out

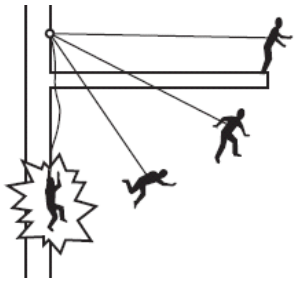
Bottoming out occurs when a falling worker hits a lower level, the ground, or some other hazard before the fall is fully arrested. This occurs when the fall clearance is greater than the distance from the work surface to the next level, the ground, or some other hazard below.

A personal fall arrest system must be planned, designed, and installed to provide sufficient clearance distance so that a worker cannot hit the ground or an object or level below the work area.



Various factors must be accounted for in typical clearance calculations, including: the sag of the lifeline (if a horizontal life line is used), the length of the lanyard, shock absorber (deceleration distance), harness stretch, height of the worker, and a safety factor providing clear space between the worker and the lower surface or object.

Pendulum Effect



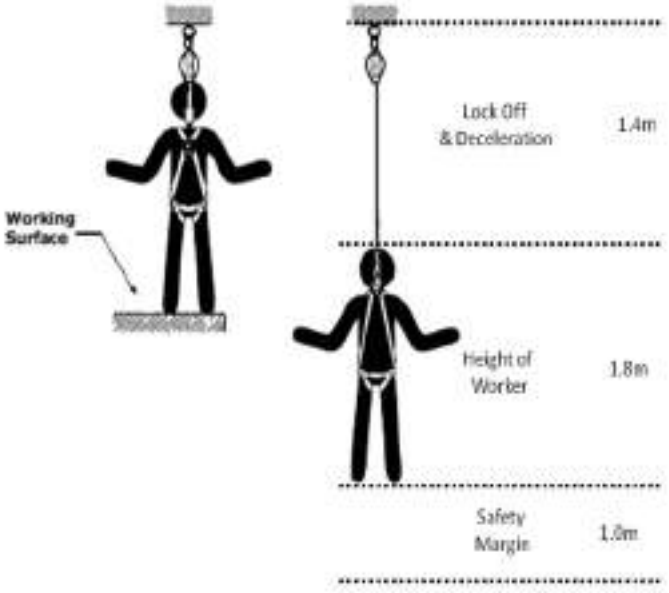
The further you move sideways from your anchor point, the greater the chance of swinging if you fall. This is known as the "pendulum effect." The wider you swing, the greater the force with which you'll strike columns, walls, frames, or other objects in your path.

If involved in a fall while using a shock-absorbing lanyard or self-retracting lifeline, and with an anchorage point that is not positioned directly overhead, a swing fall or pendulum effect will occur. Striking an object while swinging can lead to serious injury.

Whether using shock-absorbing lanyards or self-retracting lifelines, it is very important to position your anchorage point directly overhead whenever possible to minimise swing falls.

Fall Clearance

Fall clearance is the vertical distance needed to safely arrest a fall so that the worker does not hit the ground. When setting up and using a personal fall arrest system, fall clearance is a critical issue. Should a fall occur, there must be sufficient clearance below the user to arrest the fall before the user strikes the ground or any other object.



The user of the equipment must determine if the system will arrest the fall within the available clearance. Some factors that affect this determination include:

- anchorage location
- type and length of connecting system (lanyard, self-retracting lifelines, rope grab)
- deceleration distance (deployment of shock absorber)
- worker height
- safety margin

To determine the required fall clearance, add up the appropriate factors. This will give you the safe required distance below the working surface for work which is to be carried out where there is any risk of falling.

For example, a worker using a self-retracting lanyard on a fixed anchor point will have to take into consideration the following:

- **Lock Off & Deceleration** **1.40m**
- **Height of Worker** **1.80m**
- **Safety Margin** **1.00m**
- **FALL CLEARANCE** **4.20m**

For a fall arrest system to be effective in this scenario, the working height would need to be **at least 4.2m** from the nearest obstruction.

In this scenario, anything less than **4.2m** and there is potential for the worker to be injured in the event of a fall.

Note that the 1.4m for lock off and deceleration has an allowance for the start position/extension prior to commencement of fall.

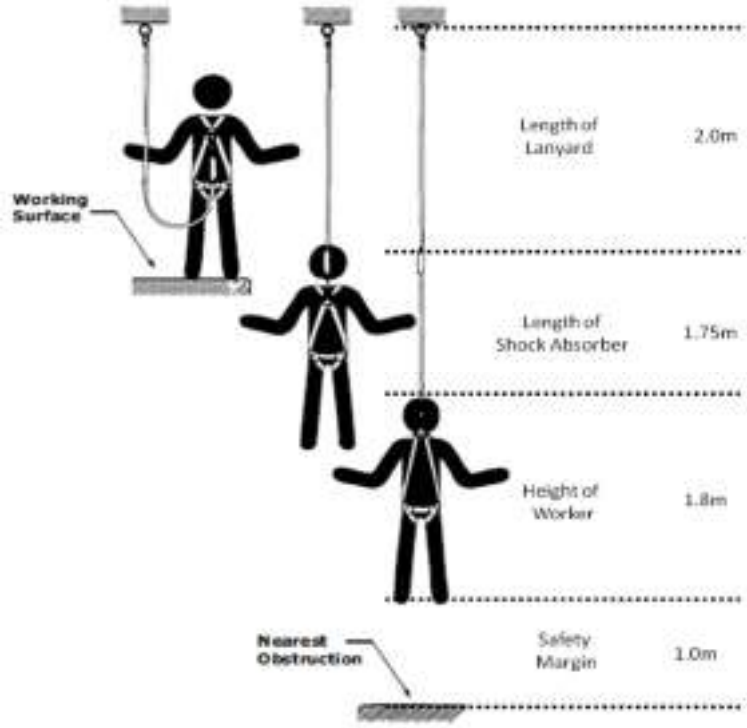
In another example, a worker using a shock absorbing lanyard on a fixed anchor point will have to take into consideration the following:

- **Length of Lanyard** **2.00m**
- **Length of Shock Absorber** **1.75m**
- **Height of Worker** **1.80m**
- **Safety Margin** **1.00m**
- **FALL CLEARANCE** **6.55m**

For a fall arrest system to be effective in this scenario, the working height would need to be **at least 6.55m** from the nearest obstruction.

Anything less than that and there is potential for the worker to be injured in the event of a fall.

In a third example, a worker using a shock absorbing lanyard on a static line will have to taken into consideration the following:



- **Static Line Sag Factor** **1.50m**
- **Length of Lanyard** **2.00m**
- **Length of Shock Absorber** **1.75m**
- **Height of Worker** **1.80m**
- **Safety Margin** **1.00m**
- **FALL CLEARANCE** **8.05m**

For a fall arrest system to be effective in this scenario, the working height would need to be at least 8.05m from the nearest obstruction.

Anything less than that and there is potential for the worker to be injured in the event of a fall.

Note that the 1.5m for the static line sag factor is an estimated maximum and will vary depending on the length of the static line, the number of users attached and the weight of the worker who has fallen.

Working at Low Heights

As shown in the examples above, fall clearance is an extremely important consideration during work planning. So what if the height you are required to work at is only 2.5m high?

It is essential to select a fall prevention and protection system that will work with the calculated fall clearance. Consider other alternatives such as elevating work platforms or scaffolding. Ladders should be used for access and egress but not as a method of actually working at heights.




Housekeeping

Basic care for fall protection safety equipment will prolong the life of the equipment and contribute toward the performance of its vital safety function. At the completion of work, all height safety equipment needs to be removed (including dismantling and removing safety systems ensuring consultation with authorised personnel) and returned to the correct storage location.

Proper storage and maintenance after use is as important as cleaning the equipment of dirt, corrosives or contaminants. The storage area should be clean, dry and free of exposure to fumes or corrosive elements.

At the completion of your working at heights job make sure you:

- Visually inspect your fall arrest equipment for any damage caused whilst wearing it
- Clear your work area of tools and equipment and follow all site and company policies
- Dispose of any rubbish in appropriate bins or recycle containers
- Sign off on any permits or site procedures where necessary and lodge any paperwork with supervisors as necessary

Cleaning of Equipment

Wipe off all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip the sponge in a mild solution of water and commercial soap or detergent. Work up a thick lather with a vigorous back and forth motion. Then wipe the harness dry with a clean cloth. Hang freely to dry but away from excessive heat.

Harness, lanyards and other equipment should be dried thoroughly without exposure to heat, steam or long periods of sunlight.

Storage

If possible store your harness and gear in a bag, keep it clean away from light. Store in clean, dry cool area free from chemical fumes and corrosive materials. Never store wet or in direct sun light and keep equipment off the ground by hanging it up. Ensure that lanyards and connectors are not hanging on the ground.

References

- Work Health and Safety Act 2011
- Work Health and Safety Regulations 2011
- Code of Practice Managing the risk of falls at workplaces March 2015
- Code of Practice for Prevention of Falls at Workplaces (WA)
- Code of Practice for Managing the Risk of Falls at Workplaces (National)
- Guidance Note for Working at Heights (SafeWork SA)
- AS/NZS 1576 Scaffolding
- AS/NZS 1891.1 Industrial fall-arrest systems and devices – Harnesses and ancillary equipment
- AS/NZS 1891.2 Industrial fall-arrest systems and devices – Horizontal lifeline and rail systems
- 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 4576 Guidelines for scaffolding
- AS 1657 Fixed platforms, walkways, stairways and ladders - Design, construction and installation
- AS 2359 Powered industrial trucks (known as the SAA Industrial Truck Code)
- AS 4142.3 Man-made fibre rope for static life rescue lines
- SafeRight – Fallright Height Safety Equipment
- Capital Safety Australia – Height Safety Essentials