INTEGRAL SKILLS

WORKING SAFELY AT HEIGHTS

RIIWHS204E Work safely at heights

LEARNER GUIDE

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MODIFICATION HISTORY

Version	Date	Nature of Amendment
1	7 Feb 19	Creation
2	26 Mar 20	Added second unit of competency
3	21 Oct 20	Updated the RII version to 'E'
4	7 Jan 21	Remove CPC Unit of Competency
5	20 Mar 24	QR Code added to the cover page

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INTRODUCTION

This training course is based on the unit of competency RIIWHS204E Work safely at heights. This unit describes a participant's skills and knowledge required to work safely at heights in Industry.

This unit is appropriate for those working in operational roles where they are required to perform work at heights.

The materials provided include the information you need to undertake safe working practices at heights.

Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and Industry sectors. Relevant information must be sourced prior to application of the unit.

RIIWHS204E WORK SAFELY AT HEIGHTS

PERFORMANCE EVIDENCE

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- work safely at heights on at least two occasions, including:
    - accessing, interpreting and applying technical and safety information for working at heights
    - assessing hazards and risks associated with working at heights and implementing control methods
    - selecting, wearing and caring for personal protective equipment
    - identifying required safety systems including fall protection and associated equipment
    - checking the correct fitting, adjusting and anchoring of fall protection and associated equipment
    - performing work safely at heights.

During the above, the candidate must:

- locate and apply relevant documentation, policies and procedures and confirm that the work activity is compliant
- implement the requirements, procedures and techniques for working safely at heights

- work effectively with others to work safely at heights in a way that meets all required outcomes
- communicate clearly and concisely with others to receive and clarify work instructions and to determine coordination requirements prior to commencing and during work activities.

KNOWLEDGE EVIDENCE

The candidate must be able to demonstrate knowledge to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including knowledge of:

- key legislation required to work safely at heights
- key policies, procedures and documentation required to work safely at heights, including:
    - statutory and regulatory authority requirements
- principles and techniques for work safely at heights, including:
    - heights safety systems
    - safe work methods
- principles and techniques for identifying names and functions of equipment, components and materials
- principles and techniques for complying with equipment manufacturer instructions and specifications
- safe shifting and handling of tools and materials
- principles and techniques for identifying relevant hazards and emergencies
- techniques for coordinating and communicating job activities with others.

ASSESSMENT CONDITIONS

Assessors must be able to clearly demonstrate current and relevant industry knowledge and experience to satisfy the mandatory regulatory standards as set out in the Standards for Registered Training Organisations (RTOs) 2015/Australian Quality Training Framework mandatory requirements for assessors current at the time of assessment and any relevant licensing and certification requirements. This includes:

- vocational competencies at least to the level being delivered and assessed
- current industry skills directly relevant to the training and assessment being provided
- current knowledge and skills in vocational training and learning that informs their training and assessment

- formal relevant qualifications in training and assessment
- having knowledge of and/or experience using the latest techniques and processes
- possessing the required level of RII training product knowledge
- having an understanding and knowledge of legislation and regulations relevant to the industry and to employment and workplaces
- demonstrating the performance evidence, and knowledge evidence outlined in this unit of competency, and
- the minimum years of current** work experience after competency has been obtained as specified below in an industry sector relevant to the outcomes of the unit.

It is also acceptable for the appropriately qualified assessor to work with an industry expert to conduct assessment together and for the industry expert to be involved in the assessment judgement. The industry expert must have current industry skills directly relevant to the training and assessment being provided. This means the industry subject matter expert must demonstrate skills and knowledge from the minimum years of current work experience after competency has been obtained as specified in the unit of competency.

IDENTIFY WORK REQUIREMENTS

WORKING AT HEIGHTS

Working at heights is where there is a risk of a fall by a person from one level to another that is reasonably likely to cause injury to the person or any other person.

Includes the risk of fall:

- In or on elevated workplace from which a person could fall, or
- In the vicinity of an opening through which a person could fall, or
- In the vicinity of an edge over which a person could fall, or
- On a surface through which a person could fall, or
- In any other place from which a person could fall.

Wherever possible, the need to work at heights should be eliminated, however if this option is not reasonably practicable all steps should be taken to minimise the risk involved. The Code of Practice 'Managing the Risk of Falls at Workplaces' provides additional guidance in these steps.

Any work that must be conducted at heights requires adequate training, instruction and the employment of systems to prevent unwanted outcomes.

Figure 1 – Decent from EWP

HOW CAN WE WORK SAFELY AT HEIGHTS?

The risk of injury or death as a result of working at heights to either workers or other people in the area is a serious concern.

Every year people are injured or even killed when they fall from a height or are hit by equipment or materials falling on them from above.

Working safely at heights requires careful planning and consideration, as well as the implementation of hazard controls/treatments to eliminate or minimise the risks of falls.
It is very important that all risks are identified and controlled and that appropriate safe work practices and training are applied to make sure that all people in the work area are kept safe.

In order to Work Safely at Heights you must make sure you have properly planned the work to be completed.

Therefore we can conduct work at heights safely by:

- Planning the work.
- Identifying hazards/risks.
- Implementing hazard/risk treatments.
- Working in accordance with:
    - Procedures (site and equipment).
    - Regulations.
    - Codes of practice.
    - Australian Standards.

LEGISLATION, REGULATIONS AND SAFETY REQUIREMENTS

Part of the process of planning for work at heights includes accessing, interpreting and applying the relevant compliance documentation.

What is Compliance Documentation?

Compliance documentation is essential to all aspects of operations on every worksite.
From work instructions through to quality and environmental requirements, compliance documentation sets out the what, when, how and who of everything that needs to be done in the safest, most effective way.

Interpretation of compliance documentation will allow you to make the right decisions for each situation or task. Interpretation means understanding what is required of you and how you are expected to perform the tasks.

Applying documentation involves following all instructions given by these documents at all times – they are designed to keep you safe.

Statements containing the words “must”, “shall” or “will” are often used within these documents to indicate that there are mandatory (legally must be applied) requirements.
Each project site will have different compliance documentation that must be referred to.

This may include:

- Legislative, organisation and site requirements and procedures.
- Occupational Health and Safety (OHS)/ Workplace Health and Safety (WHS) legislation, codes of practice and guidance material.
- Manufacturers’ guidelines and specifications.
- Australian Standards.
- Codes of Practice.
- Equal Employment Opportunity and Disability Discrimination legislation.
- Licence and certification requirements.
- Internal permit control systems.
- Mechanical and electrical isolation processes.
- Company policy and permit control systems.

Compliance documentation may be provided by:

- WHS authorities and ASCC/NWHSC.
- Environment Protection Authority (EPA).
- Employment and workplace relations legislation.

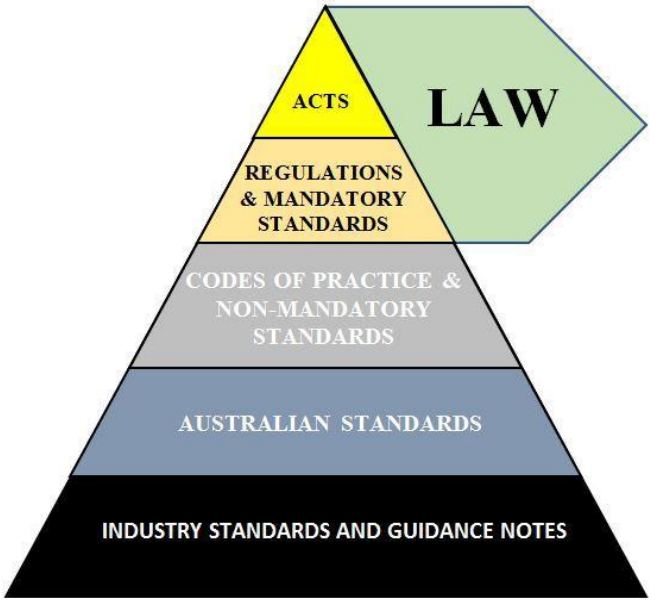


Figure 2 – Legislation Hierarchy

WHS Legislation and Regulations

Workplace Health and Safety (WHS) are laws and guidelines to help keep your workplace safe.

These can be broken down into four main types:

- Acts & Regulations.
- Codes of Practice.
- Australian Standards.
- Regulations.

Legislation/Acts	Acts of Parliament and laws to protect the health, safety and welfare of people at work. For example the Work Health and Safety Act (the WHS Act) 2011.
Regulations	More details or information on particular parts of the Act.
Codes of Practice/Compliance Codes	Practical instructions on how to meet the terms of the law. For example the Code of Practice "Managing the Risk of Falls in Workplaces".
Australian Standards	The minimum levels of performance or quality for a hazard, work process or product. For example AS/NZS 1891

Table 1 – Legislation Descriptions

Harmonisation of Workplace Health & Safety Legislation

In 2011, Safe Work Australia developed a single set of WHS laws to be implemented across Australia. These are known as 'model' laws. For the model WHS laws to become legally binding, the Commonwealth, states and territories must separately implement them as their own laws.

The model WHS laws include:

- The model WHS Act.
- The model WHS Regulations.
- Model Codes of Practice.

These elements are supported by the National compliance and enforcement policy, which sets out principles of how WHS regulators monitor and enforce compliance with their jurisdictions' WHS laws. WHS regulators in the Commonwealth and in each state and territory are responsible for regulating and enforcing the laws in their jurisdictions.

The model WHS laws have been implemented in the Australian Capital Territory, New South Wales, the Northern Territory, Queensland, South Australia, Tasmania and the

Commonwealth. Some jurisdictions have made minor variations to make sure the legislation is consistent with their relevant drafting protocols and other laws and processes.

Model WHS Act

The Model WHS Act forms the basis of the WHS Acts that have been implemented in most jurisdictions across Australia.

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. It does this by:

- Protecting workers and other persons from harm by requiring duty holders to eliminate or minimise risk.
- Providing for fair and effective representation, consultation and cooperation.
- Encouraging unions and employer organisations to take a constructive role in promoting improvements in WHS practices.
- Promoting the provision of advice, information, education and training for WHS.
- Securing compliance with the Act through effective and appropriate compliance and enforcement measures.
- Ensuring appropriate scrutiny and review of actions taken by persons with powers or functions under the Act.
- Providing a framework for continuous improvement.
- Maintaining and strengthening national harmonisation of WHS laws and facilitating a consistent national approach to WHS.

CODES OF PRACTICE AND AUSTRALIAN STANDARDS

Model Codes of Practice are practical guides to achieving the standards of health and safety required under the model WHS Act and Regulations.

To have legal effect in a jurisdiction, a model Code of Practice must be approved as a code of practice there. To determine if a model Code of Practice has been approved in a particular jurisdiction, check with your local WHS regulator.

An approved code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in a jurisdiction's WHS Act and Regulations.
Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks that may arise. Health and safety duties require you to consider all risks associated with work, not only those risk that regulation and codes of practice exist for.

While approved codes of practice are not law, they are admissible in court proceedings. Courts may regard an approved code of practice as evidence of what is known about a hazard,

risk or control and may rely on the relevant code to determine what is reasonably practicable in the circumstances.

For working at heights the main Code of Practice to be familiar with is 'Managing the Risk of Falls at Workplaces'.

Australian Standards relating to working at heights include:
AS/NZS 1657 Fixed platforms, walkways, stairways and ladders—Design, construction and installation.
AS/NZS 1891.4:2009 - Industrial fall-arrest systems and devices.
AS/NZS 1892.5:2000 - Portable ladders series.
AS/NZS 4389:2015 - Safety mesh.
AS/NZS 4488.2:1997 - Industrial rope access systems.
AS/NZS 4576:1995 - Guidelines for scaffolding.
AS 2550.16-1997 - Cranes—Safe Use—Mast climbing work platforms.
AS/NZS 4994.3:2010 - Temporary edge protection series.

ORGANISATIONAL AND SITE REQUIREMENTS
During your site induction your employer will tell you where to find the compliance documentation relevant to your site and duties.

All work at heights needs to be conducted in accordance with organisational policies and procedures and site requirements.

Procedures exist to ensure that all work is completed in a way that is safe and achieves the required outcomes efficiently without causing harm.

MANUFACTURERS GUIDELINES AND SPECIFICATIONS
These requirements will be documented in operator's manuals, equipment specifications and work instructions.

Designers and manufacturers have a responsibility to ensure that structures, plant and equipment meet strict criteria for the safe operation and protection of workers while also meeting relevant environmental standards.

ENVIRONMENTAL PROTECTION REQUIREMENTS
When carrying out any work at heights, you should always aim to reduce environmental risk and waste.

To do this you need to:

- Identify the environmental management plans, requirements and constraints.

- Confirm any aspect of the environmental protection requirements that may be unclear.
- Apply and comply with the project environmental protection requirements of all tasks undertaken in and around the worksite.

Some environmental requirements are:

- Organisational/project environmental management plans – These outline the steps and processes required to prevent or minimise harm to the environment due to work operations.
- Waste/clean-up management – This covers the disposal of site waste materials and rubbish as well as the recycling and re-use of waste materials.
- Water quality protection – This can include methods for directing run-off away from the stormwater system or other waterways. Spills of chemicals or other materials and the use of spill kits are included.
- Noise, vibration and dust management – These plans aim to limit or avoid creating noise pollution and vibration for people in and around the worksite. Dust management includes the use of screens, tarpaulins and other dust suppression methods.

The NSW Environmental Protection Authority (EPA) can investigate and issue fines for sites that do not meet the state and federal environmental protection arrangements that are in place.

If you have concerns, questions or queries about the exact requirements you must meet, you should speak to your supervisor, the site environmental officer or contact the NSW EPA for more information.

REVIEW TECHNICAL INFORMATION BEFORE YOU START

Before starting your work at heights you need to make sure you obtain all the relevant technical information appropriate for your worksite. This will enable you to conduct your work at heights in the safest and most efficient way. This may include:

- Identification and description of the work site (e.g. site details).
- Assessment of conditions and hazards (e.g. hazard report).
- Work requirements from work orders and supervisor instructions.
- Identifying equipment defects (e.g. fault reports or isolation systems).
- Accessing diagrams or plans.

Figure 3 – Decent from EWP

SCOPE OF TASK AND WORK ACTIVITIES

In planning your work it is important to identify and document the scope of the tasks and the proposed safe work practices and activities you will undertake to complete them. Working at heights involves staff operating in dangerous elevated positions. These can include working on or around bridges, buildings, roofs, unguarded shafts or excavations, scaffolds, Elevated Work Platforms (EWP), forklifts and many other situations. The tasks performed at heights could include, construction, renovation, maintenance, installation or even rescue operations.

MANAGE HAZARDS

If you can remove or at least control a hazard you can reduce the risk involved. Each worksite has its own specific risks and hazards. A site induction should inform you of known hazards which exist on site. Some of these hazards can be removed through staff training, better equipment and safe work methods.

Risk Management is the process of reducing or managing the risks when working with a hazard or in a hazardous situation and should take into consideration the context of the organisation and work site.

Risk Management must be conducted in accordance with:

- Legislative, organisational and site requirements/procedures.
- Australian Standards.
- Codes of Practice.
- Employment and workplace relations legislation.
- Equal employment opportunity and disability legislation.

Consultation, communication, monitoring and review should be planned for and carried out at every stage of the risk management process.

Identifying risks and hazards and establishing ways of controlling them usually includes talking to the people with knowledge of the situation, or who are directly affected by any action you may take.

Controlling a hazard should be a team effort and it's important that everybody not only has input, but knows what they need to do and how/if they need to change their work processes to suit.

Monitoring and review are an important part of the risk management process and should be planned for at every stage. Monitoring and review involves regular surveillance and checking and clearly identifying the responsibilities of those involved.

It is important that monitoring and review results are recorded, reported and stored for future reference.

Inspecting the Site for Hazards

Before any work is started, the worksite should be inspected and all information obtained that will enable all job and legislative requirements to be met. You will need to identify any locations or tasks that could result in a person falling from height, such as working on a roof or working on a fragile or suspect surface. Hazards to look for include (but is not limited to) slippery surfaces, unstable or incomplete structures, uneven surfaces, areas of poor housekeeping, unprotected edges and environmental conditions such as excessive heat or cold, wind or rain etc.

You also need to be aware of manual handling hazards such as:

- Inappropriate carrying of materials on ladders.
- Excessive bending or twisting in different work situations.
- Incorrect use of ladders.
- Clothing "catching".
- Loss of hand grip.
- Moving from one surface to another.

Sometimes it may be the amount of time a worker is exposed to a particular situation that creates a hazard. This may depend on the physical condition, experience or training of the worker and may create more risk to one person than another.

It is important that you report all risks and hazards to the appropriate personnel, such as your supervisor, worksite manager or WHS officer.

Checking Weather Conditions

It is important that you remain aware of changing weather conditions so that you can adjust your operating methods and techniques where appropriate, or stop work altogether if necessary (e.g. lightning is occurring in the area). Sudden strong gusts of wind may cause workers to lose their balance or cause materials or equipment to be swept over the edge of the work area. Rain may cause the surface of the work area to become slippery.

PRE-WORK HAZRAD ASSESSMENT e.g. SWMS/JSEA's etc

A Risk Assessment to identify hazards is to be undertaken prior to working at height. Such Risk Assessments as an example may include:

- Personal Risk Assessments;
  - Take 5, and
  - SLAMS.
- Group Risk Assessments;
  - Safe Work Method Statements (SWMS), and
  - Job Safety and Environment Analysis (JSEA's).

SWMS/JSEA's may also have been used in the development of as Safe Work Procedures (SWP) and Standard Operating Procedures (SOP). They detail the steps required to carry out a task as well as how specific hazards and risks related to a task will be managed.

They fulfil a number of objectives:

- They outline a safe method of work for a specific job.
- They provide a documented set of steps / processes that workers must read and understand before starting the job.
- They assist in meeting legal responsibilities for the risk management process, hazard identification, risk assessment and risk control.
- They assist in effectively coordinating the work, the materials required, the time required and the people involved to achieve a safe and efficient outcome. They are a quality assurance tool.

How do you complete a SWMS/JSEA?

Each organisation will have different forms and documents to manage risk, some called SWMS, JSEA, JSA etc. The fundamental steps remain the same as follows:

- Break the job down into its basic steps.
- Identify the workplace hazards associated with each step.
- Identify controls to eliminate or control those hazards.
- Rate / rank the risk with the controls in place, this is called the residual risk.
- Once agreement to the hazards and risk ratings has been achieved, the residual risk must be as low as reasonably achievable.
- Each person signs the SWMS/JSEA acknowledging that they have understood its contents.
- Put controls in place.
- Proceed with job, monitoring the controls for effectiveness and looking for new hazards.

The SWMS/JSEA must be available for inspection at any given time and must be reviewed as conditions change.

Risk / Hazard Assessment

Risk/Hazard Assessment has 2 stages:

(1) Risk/Hazard Analysis.

Risk analysis is used to determine the seriousness of a hazard based on how likely it is to happen and the consequences if it does happen. The risk level of each identified hazard should be worked out. Risk analysis comprises of 3 factors Likelihood, Consequence and Risk level.

Using a table similar to the one below, you can analyse how high the risk level is.

Likelihood	Consequence				
	Insignificant	**Minor** First Aid required	**Moderate** Medical attention and time off work	**Major** Long term illness or serious injury	**Severe** Kill or cause Permanent Disability or Illness
Almost certain	M	H	H	VH	VH
Likely	M	M	H	H	VH
Possible	L	M	H	H	VH
Unlikely	L	L	M	M	H
Rare	L	L	M	M	M

Table 2 – Likelihood vs Consequence Matrix

(2) Risk/Hazard Evaluation.

Risk evaluation is based upon the outcomes and results of the risk analysis.

Risk evaluation involves making decisions about:

- Have all the hazards been controlled.
- Is the residual risk acceptable.
- Is it safe to proceed.

Your evaluation should be used to determine how soon you should act to remove or control the hazard to achieve an acceptable level of risk.

You can do this using a table similar to the one shown below:

Risk Level	Action
Very High	Act immediately: The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of risk controls.
High	Act today: The proposed activity can only proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk control. 2. The risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. 3. The risk assessment has been reviewed and approved by the Supervisor. 4. A Safe Working Procedure or Safe Work Method has been prepared. 5. The supervisor must review and document the effectiveness of the implemented risk controls.

Medium	Act this week: The proposed task or process can proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk assessment has been reviewed and approved by the Supervisor. 3. A Safe Working Procedure or Safe Work Method has been prepared.
Low	Act this week: The proposed task or process can proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk assessment has been reviewed and approved by the Supervisor. 3. A Safe Working Procedure or Safe Work Method has been prepared.

Table 3 – Hazard Evaluation Level example

Note: Any hazard with a residual risk level of high or very high should have further risk treatment measures (controls) in place to reduce the risk to an acceptable level. They will also require a higher level of approval in most cases and a higher level of risk management processes.

RISK/HAZARD TREATMENT

Once hazards have been identified, risk treatment options (controls) need to be considered and applied. Risk treatment involves selecting one or more controls to modify and reduce a risk and then implementing the control. Controls act as a barrier or layers preventing the unwanted event from happening. Every control has its limitations or holes in each layer and can be likened to a piece of Swiss cheese, the more layers / controls the more effective.

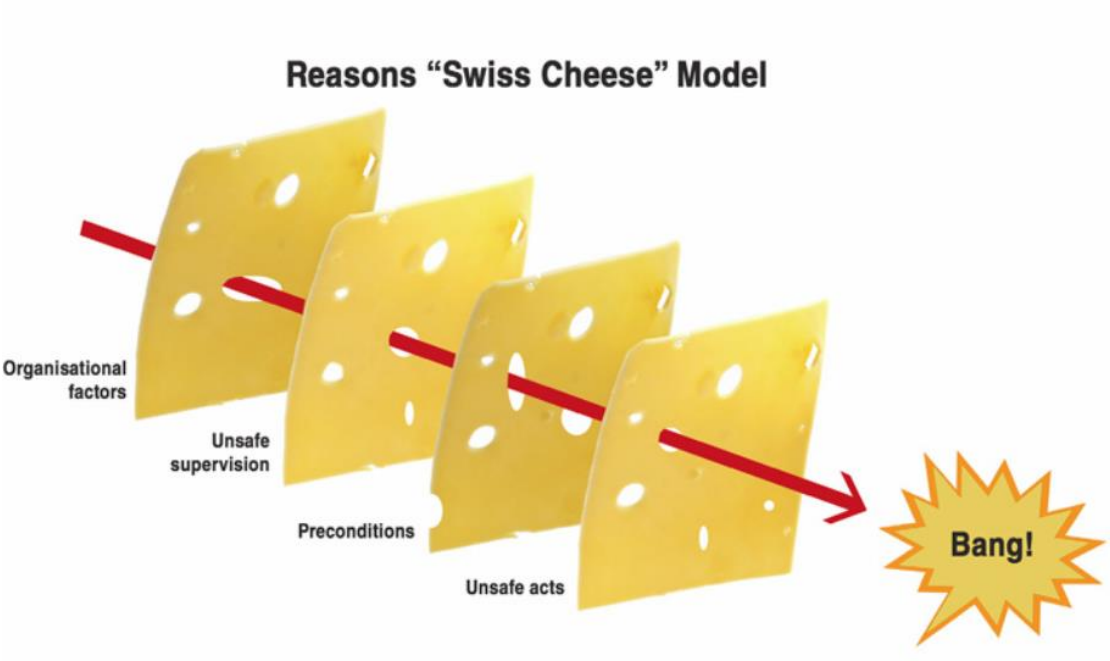


Figure 4 – "Swiss Cheese" model

Hierarchy of Control

Control measures can be ranked from the highest level of protection and reliability to the lowest. 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.

The hierarchy of control is as follows:

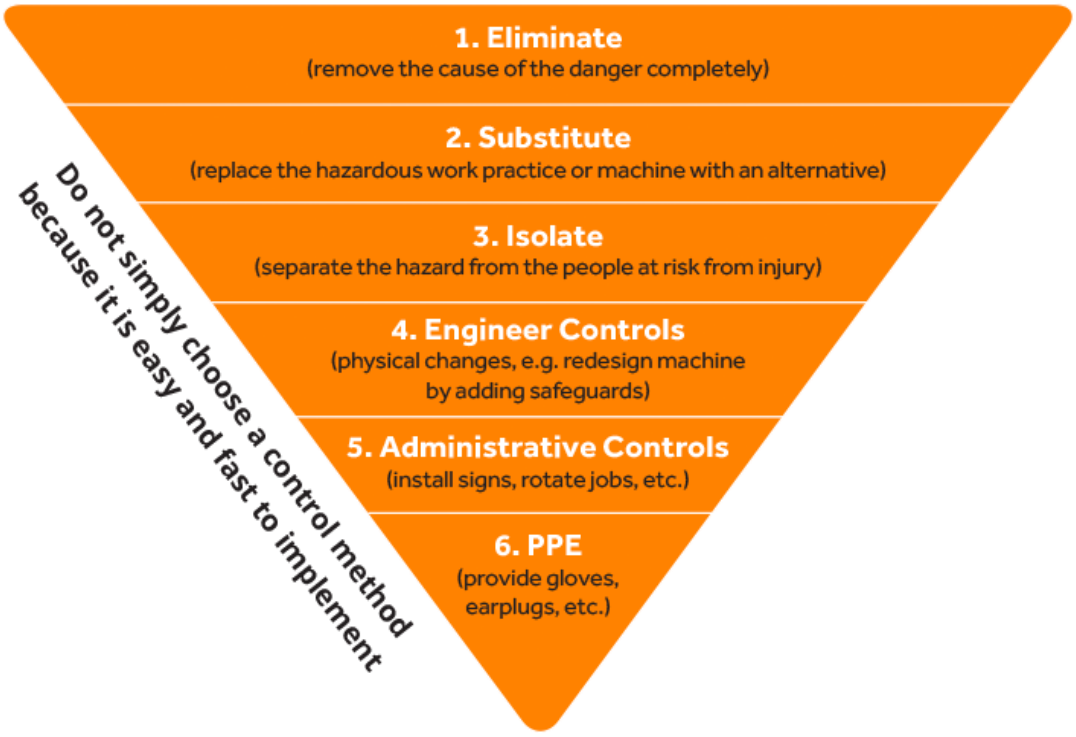


Figure 5 – Hierarchy of Control

SAFE WORK PRACTICES

Safe work practices are methods that must be implemented to make sure a job is carried out as safely as possible. Safe work practices are governed by legislative requirements and workplace procedures and relate to such things as drugs and alcohol at work, requirements for safe work at heights, including safety devices, general requirements for use of personal protective equipment and clothing just to name a few.

The scope of tasks and the safe work practices you are going to apply should be referred to, and documented, when completing Safe Work Method Statements (SWMS) or Job Safety and Environment Analysis (JSEA).

This will provide a guideline for how to carry out all tasks safely in accordance with WHS requirements.

REPORTING AND RECORD KEEPING

Make sure you record any action you have taken and talk to your supervisor and WHS officer about the control strategies in place. Keeping records is important as they can help ensure that any risk management activities are traceable.

Records also provide a basis for improving methods and tools in the risk management process, as well as improving the overall process.

SAFETY SYSTEMS AND EQUIPMENT

The most effective way to protect workers from the risk of falling is to eliminate the need to work at height. Other preventative measures include, installing a fall prevention device.
This includes any equipment that is designed to prevent a fall when someone is temporarily working at heights, which once in place does not require any further adjustment by workers using it, for example guard rails or barriers.

Installing fall prevention systems should be considered at the design and planning stage. Examples include roof safety mesh, guard railing, barriers, scaffolding or elevating work platforms (EWP's). Work procedures should be developed on how to correctly install, use and maintain the system.

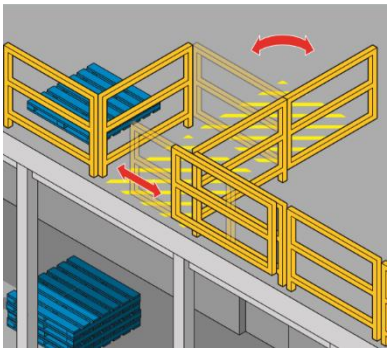


Figure 6 – Safety Rails on Mezzanine floor

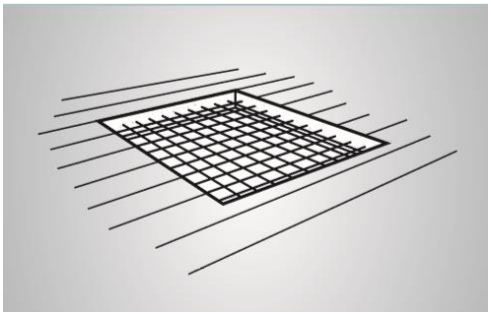


Figure 7 – Hole sealed with Mesh

All safety systems and their components should be inspected and installed by a competent person to ensure that they are fit for purpose and conform to WHS regulatory requirements and any applicable worksite policies. This includes the fitting, adjusting and anchoring of fall protection equipment.

FALL - RESTRAINT SYSTEMS

A fall-restraint system controls a person's movement by physically preventing the person reaching a position at which there is a risk of a fall. It must be set up to prevent the wearer from reaching an unprotected edge. These systems should only be used where it is not reasonably practicable to provide a barrier or guardrail at an unprotected edge.

Restraint systems are made up of a harness that is connected to an anchor point or static line via a lanyard. The anchor point should be designed for fall-arrest loading.

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,
    - The surface texture of the surface and whether it is likely to be wet, oily or otherwise slippery.
- The horizontal life lines are fitted with an industrial shock absorber when required.
- The restraint system conforms to AS/NZS 1891 Industrial fall-arrest systems and devices series.

Restraint systems should be installed by a competent person in accordance with the manufacturer's instructions and AS/NZS 1891 Industrial fall-arrest systems and devices.
Restraint techniques should only be used if it is not reasonably practicable to prevent falls by providing a physical barrier (for example, a guard rail). This is because restraint techniques require a high level of user skill to operate safely and also greater supervision.

Figure 8 – Fall restraint system

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.

The code of practice "Managing the risk of falls at workplaces" states that an individual fall-arrest system should be used instead of a restraint system in the following situations:

- 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.
- There is any other reasonably likely use or misuse of the system that could lead to a free fall.

All equipment used for fall-arrest should be designed, manufactured, selected and used in compliance with the AS1891 series of standards.

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.
- 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.

A fall-arrest system may include:

- Anchorages.
- Life lines and static lines.
- Inertia reels.
- Lanyard of fixed length.
- Retractable lifelines.
- Rope grabs.
- Wire grabs.
- Rail system.
- Shock absorbers both personal and industrial.

- Harness.
- Snap hooks (double or triple action to prevent rollout).
- Karabiners (double or triple action to prevent rollout).
- Rescue equipment.

Always select compatible components (parts) whenever preparing for work at heights.
The use of non-compatible components may lead to malfunction of the equipment, resulting in accidents, injury or death.

If you are not sure if the components of a fall-arrest system are compatible you should check with the manufacturer.

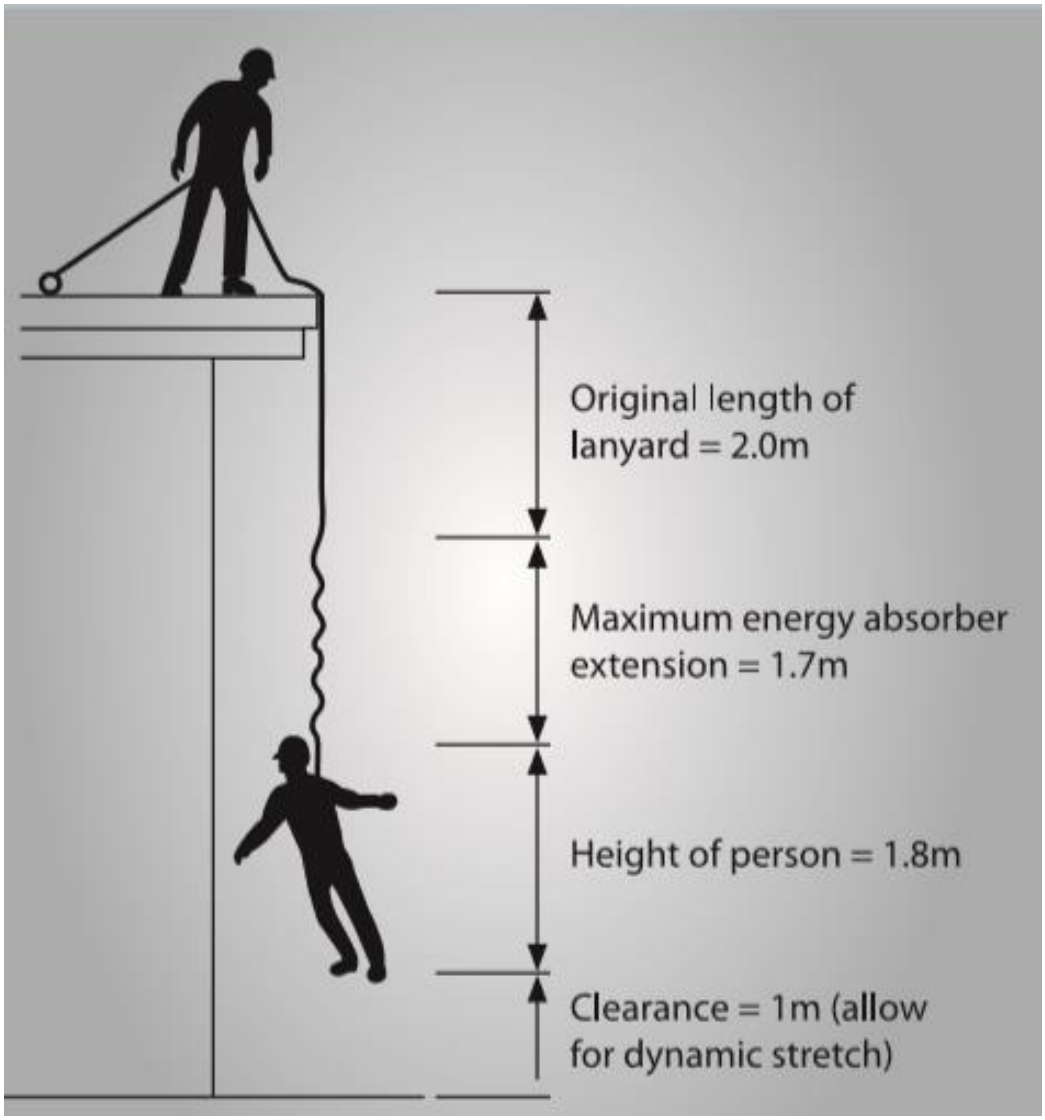


Figure 9 – Fall Arrest system (6.5m fall)

ANCHORAGE POINTS

Each anchorage point should comply with the requirements in AS/NZS 1891:4 - Industrial fall-arrest systems and devices – selection, use and maintenance. Anchorages are required, under AS/NZS 1891.4, to have a minimum breaking strength of 15kN (1500kg) for 1 person attached. An anchorage rated to greater than 21kN (2100kg) is suitable for use by no more than 2 people. 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).

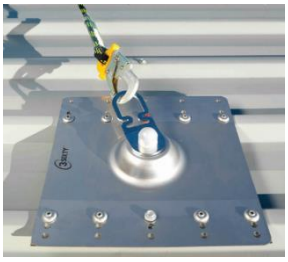


Figure 10 – Anchor point examples

Selecting Anchor Points

Solid anchor points are crucial to safe working at height – the best PPE available will not save you if you are attached to a loose and rusty handrail.

Load testing of every potential anchor point is impractical, as is the installation of purpose designed fall arrest anchorage in every situation; therefore the majority of decisions made about what is a safe anchor point are based on experience and common sense.

Generally, the strongest and safest types of non-purpose designed fall arrest anchor points are fixed steel 'I' and 'H' beams, the vast majority of which far exceed the minimum rating of 15kN. When attaching to these with slings, it is important to protect the slings from sharp edges and have an understanding of load angles as previously covered.

Scaffolding

As a rule, tubular general type scaffold should be avoided as a main anchor point as it is designed to take loads in certain different directions and couplings may be loose. If no other option exists, a minimum of two separate tubes should be incorporated in the anchor system to allow for a backup and provide load sharing.

Handrails

Like scaffold, handrails should generally be avoided as they are not designed for the suspension of fallen personnel. If no other option exists always inspect the condition of the handrail posts and use a minimum of two. Attempt to connect to the supporting steelwork. As with all vertical anchors, always attach to the lowest point to minimise leverage. Keep in

mind that handrails can rust from the inside and welded handrails are preferable to the bolted type.

Pipe Work

Pipe work comes in many designs, types and sizes. In many workplaces the use of pipe work for anchorages may be banned outright. Advice should be sought from site engineers before considering pipe work as an anchor point.

Roof Trusses

When considering timber roof trusses as potential anchor points, particular attention needs to be given to the condition, design and age of the timber itself. In older constructions, severe structural damage may be present due to rot and white ant, etc. Even when working on newer structures, an engineer should be consulted if doubt exists as to whether or not the proposed truss would be able to withstand a 15kN force.

ANCHORAGE LINES OR RAILS

Anchorage lines or rails can be temporary or permanent fall-arrest systems.
They are designed to provide continuous fall protection for workers using ladders or climbing towers on plant (e.g. tower cranes) as well as buildings or structures.

Safety considerations include that:

- The locking device is attached to the front of the harness.
- The lanyard (including all components/parts) is a maximum of 30 cm length.
- The point of connection onto the line or rail system is near the base of the ladder where a worker can safely access it before climbing up.
- The system must provide continuous connection all the way to the top (disconnecting point).
- Free fall is limited to a maximum of 60 cm.
- Permanent systems must be made of wire or rail construction and installed according to the manufacturer's instructions.

If a fall occurs, the system must be removed and inspected by a competent person before it can be re-installed and used again.

Temporary anchorage line or rail systems must comply with AS/NZS 1891.

Figure 11 – Temporary rope line with rope grab

Figure 12 – Permanent wire line with wire grab

Anchor Straps and Slings

Manmade fibre slings for use in industry should be made from polyamide (nylon) or polyester webbing. Natural fibre slings are not suitable as personal protection equipment (PPE). All slings should be sewn together and never knotted.

Figure 13 – Anchor strap

Figure 14 – Flat sling

Figure 15 - Round sling

Where slings are to be used to provide anchorages for fall-arrest equipment, that is, by wrapping them around a fixed beam, etc the following safety requirements should be followed:

- The anchorage strength of the structure around which the slings are to be rigged, meet the requirements of AS1891.4.
- The sling is protected from sharp edges and corners.
- The sling is rigged so that it cannot slip.
- The sling should not be choked unless designed to do so – SWL may be reduced by up to 30%.
- The angle of the sling legs should not exceed 120 degrees. (This may result in the safe working load of the sling being exceeded).

At 120 degrees each side of the system carries 100% of the load. Any angle greater than 120 degrees means that the load is multiplied and may become hazardous, anything less than 120 degrees, the load is divided and therefore safer. The optimum and safest angle is 50 degrees or less.

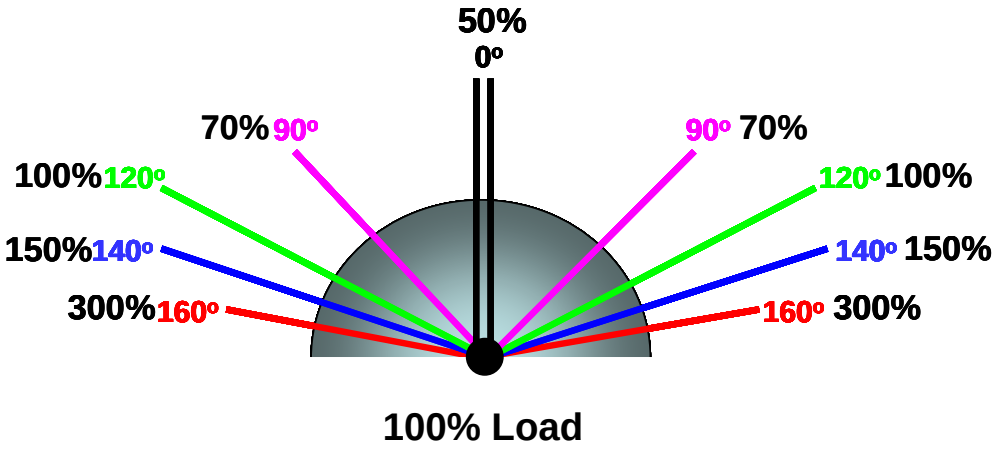


Figure 16 – Angle loading

LANYARDS

Connections between the harness and anchorage are commonly known as lanyards. There should be a minimum of slack in the lanyard between you and the anchor point, which should be as high as the equipment permits.

The length of the lanyard should restrict the fall distance to a maximum of 2 metres before the fall arrest system takes effect.

Avoid 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 lanyard snagging on obstructions.

To reduce injuries caused by a fall, energy absorbers should be used as part of the lanyard.

Figure 17 - Shock absorbing web lanyard (adjustable version up to 2 metres)

Figure 18 – Shock absorbing adjustable web lanyard with scaffold hook and tube nut connector

Figure 19 – Shock absorbing kernmantle rope lanyard (fixed length)

Figure 20 – Shock absorbing twin tail web lanyard with scaffold hooks

Figure 21 – Shock absorbing lanyard

Figure 22 – Shock absorbing wire lanyard

INERTIA REELS

Inertia reels provide a worker with a relatively free range of movement or extra reach compared to a lanyard, with the added safety feature of being able to lock in the event of a fall, arresting the descent of the worker.

Inertia reels should not be used in the following situations:

- While working on a sloped surface (e.g. a steeply pitched roof) or any other surface where a fall may not be a quick vertical one.
- Locked as a constant support for a worker during normal work.
- In conjunction with a lanyard.

Inertia reels must comply with AS 1891.3 Fall arrest devices.

Figure 23 – Inertia reel examples

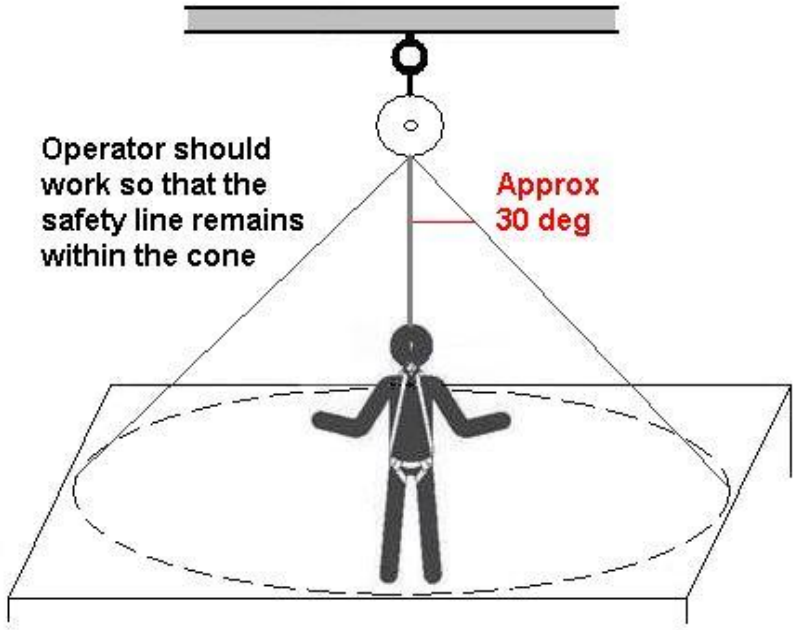


Figure 24 – Inertia Reel safe working angle

ATTACHMENT HARDWARE

Attachment hardware is the collective name for those devices that secure one device to another in the fall restraint / arrest system. For example, the harness could be connected to a sling with a karabiner (the attachment hardware device).

Some different types of attachment hardware are:

- Karabiners.
- Snap hooks (double action hooks).
- Tube nut connectors (also known as Quicklinks or Maillons).
- Block hooks or Scaffold Karabiners.
- Scaffold hooks.
- Anchor Straps and Slings.
- Manulinks.
- Beam Clamps or Trolleys.

All attachment hardware on fall arrest lanyards must be:

- At least double action or double locking. These connections require two consecutive actions to open.
- This reduces the risk of roll out and accidental opening.

Karabiners

Karabiners provide the most convenient type of connector and are common in industry as they are easily attached and detached during work operations. Karabiners used in industry must be capable of being opened only by at least two consecutive deliberate manual actions.

All types of karabiners used in industry have either double or triple action locking mechanisms:

- *Screw* gate - This is the traditional type of gate closure where the gate is manually screwed open and shut. They must be checked regularly to ensure the screwed sleeve has not worked its way loose. Some manufacturers incorporate a red warning band to give a ready visual indicator. Screw gate karabiners hung at anchor points or connected to the harness should be orientated with the gate opening downwards; in this way gravity will tend to keep the screw gate in place.
- *Double Lever* Lock - This is a different mechanism, common on snap hooks and scaffold hooks where a catch or keeper on the back of the device must be pressed to allow the gate to be pulled open. This type will close and lock automatically.
- *Ball Lock* system - With this system the ball on the sleeve must be depressed before the sleeve can be rotated and the gate opened. The gate closes and locks automatically.
- *Twist* lock - With this system the sleeve must first be pushed up before being rotated and the gate opened. This will also close and lock automatically.

Figure 25 – Karabiner screw gate

Figure 26 – Karabiner auto lock – double action

Snap Hooks

Snap hooks are also known as double action hooks. They are normally used in place of karabiners where permanent attachment to the end of fall arrest lanyards and shock absorbers are required. They are normally manufactured from alloy.

Figure 27 – Snap hook

Tube Nut Connectors

These devices are classified as a screwed closure connector and therefore meet the minimum standard of double action. Tube nut connectors come in a variety of shapes giving possibilities for multi-directional loading configurations. They offer a good strength to size ratio and are useful when the connector must remain in a fixed position for an extended period. For example, some manufacturers supply shock absorbing lanyards that are permanently attached to a harness via a tube nut connector.

Figure 28 – Tube nut connector – delta shape

Figure 29 – Tube nut connector – standard long shape

Block Hooks and Scaffold Karabiners

Block hooks or scaffold karabiners are simply larger style karabiners with a gate opening of at least 50 mm and larger. They can be used in place of an anchor sling by inserting the device through a hole in the 'I' or 'H' beam and then connecting the lanyard directs to the block hook itself. Block hooks or scaffold karabiners are always double action locking.

Scaffold Hooks

Scaffold hooks are similar to scaffold karabiners and are designed primarily for attachment to scaffold tubes. Normally constructed of alloy metal with a gate opening of at least 50mm and larger. They are often permanently attached to the end of a lanyard or twin access lanyard. Scaffold hooks are always double action.

Figure 30 – Scaffold hook examples

The below figures show the correct and incorrect methods of attaching connectors to anchorage points.

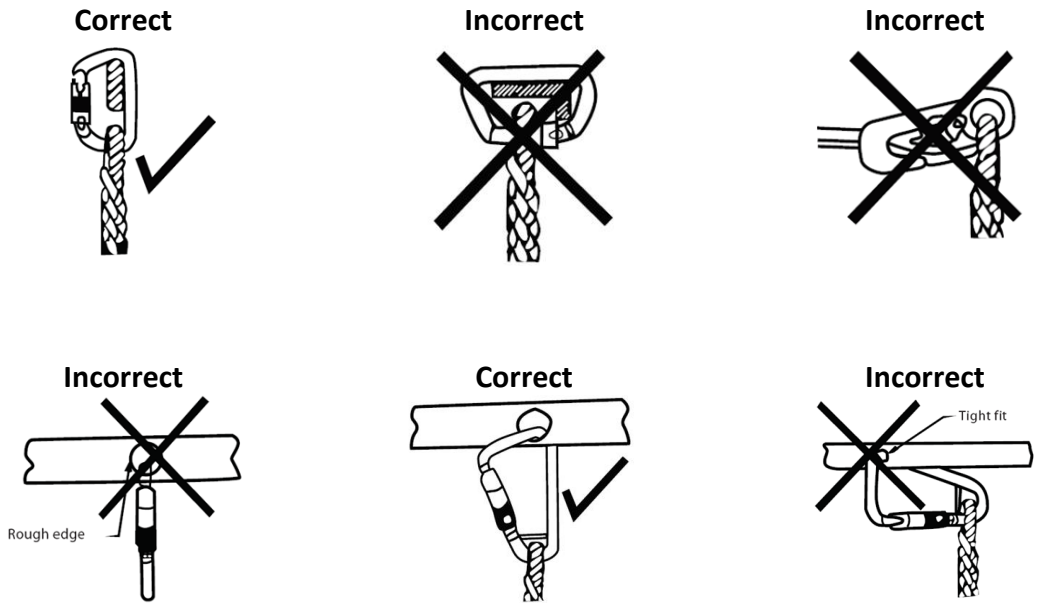


Figure 31 – Anchor point connection examples

Manulinks

Manulinks are also known as wire connectors. These devices are designed to connect to pipe work, scaffolds and other round type potential anchorage structures, where a wider gate opening is required. They range in diameter from 80mm to 140mm. Manulinks should only be used on horizontal plane anchor points.

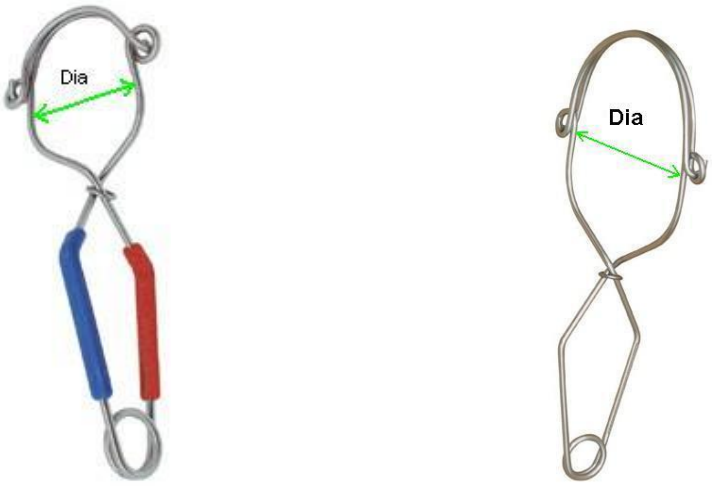


Figure 32 – Manulinks

Beam Clamps and Trolleys

Beam clamps and trolleys are specifically designed to be attached to 'I' and 'H' beams so that a lanyard or lifeline can be connected to the beam via these devices. Trolleys are designed to follow the moving worker below, thus avoiding the risks of pendulum effect (described later).

Figure 33 – A beam trolley

Figure 34 – A beam clamp

FALL-ARREST HARNESSES

In most cases of working at heights a full body harness should be worn.
Harnesses must be correctly fitted in accordance with manufacturer's instructions to ensure effectiveness.

Workers should connect the fall-arrest line to the attachment point on their harness (dorsal attachment point in the middle of the back, or the chest connection) that will provide the best protection in the situation it is being used.

Safety harnesses must meet the requirements of AS/NZS 1891 Industrial fall-arrest systems and devices.

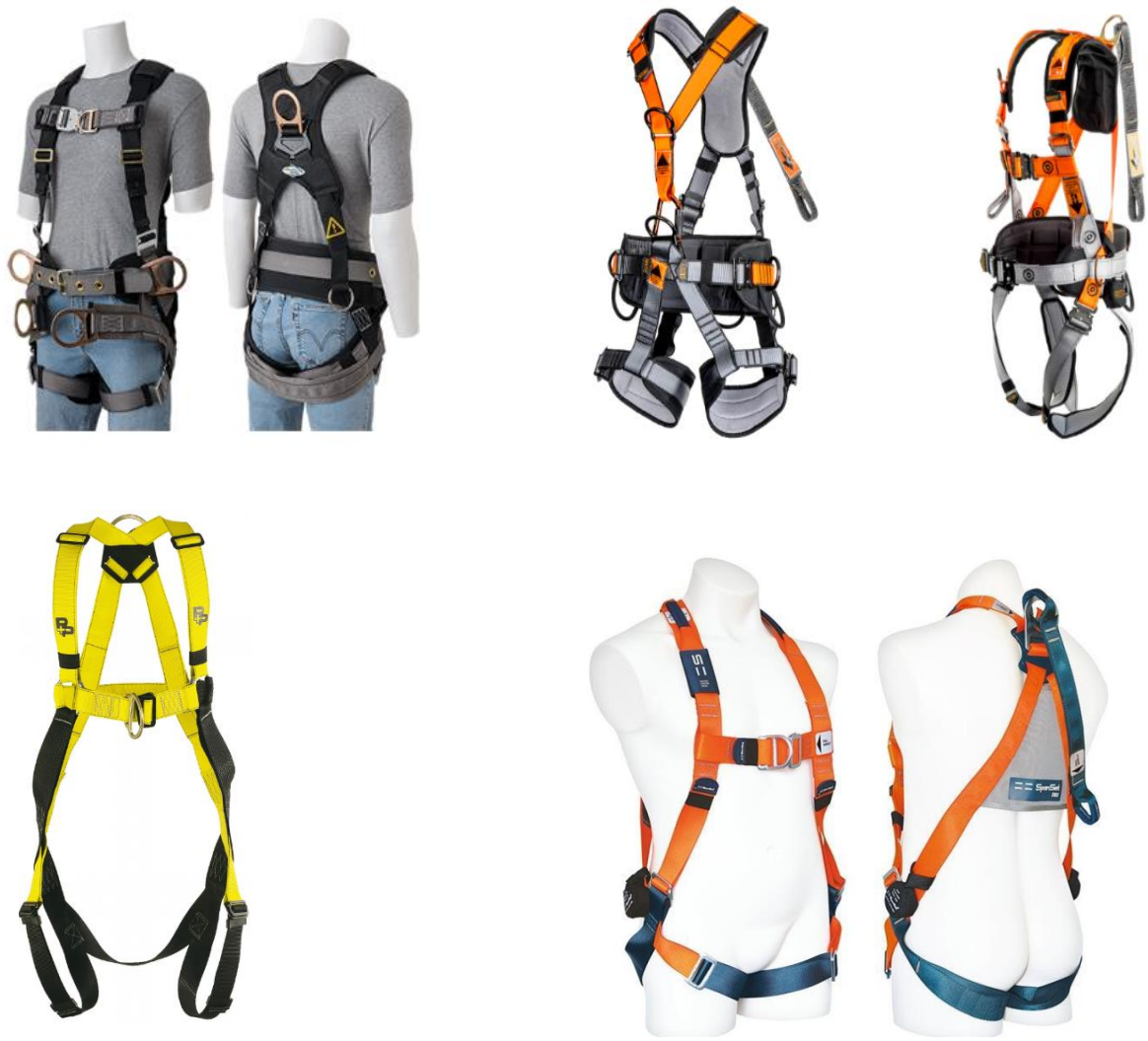


Figure 35 – Full body harness examples

The harness is correctly fitted when:

- The dorsal ‘D’ ring (rear) is between the shoulder blades.
- The shoulder straps are firm.
- The chest strap is firm and located mid-chest.
- The chest loops sit behind the chest straps.
- The leg straps are firm.
- There are no twists in any straps.
- The butt strap is located just below the buttock.
- Spare strap ends are tucked away.

Figure 36 – Correctly fitted full body harness

THE PENDULUM EFFECT

If a worker who is using an individual fall-arrest system falls from an edge, the system may act as a pendulum. This may result in the worker hitting the ground (called ‘swing down’) or swinging back into the building or structure (called ‘swing back’). These situations may also be referred to as ‘the pendulum effect’.

Swing down can occur if the lanyard slides back along the perimeter edge of the roof as a worker falls, until it is vertical. When this happens, the worker may hit the ground (or lower level), or the lanyard may break from being dragged across the edge of the roof.
The code of practice ‘Managing the risk of falls at workplaces’ lists the following measures to address ‘swing down’:

- The installation of guard rails.
- Placing the anchorage point at a right angle to the position of the lanyard at the perimeter edge (for example, by using a mobile anchorage).

- The installation of a second anchorage point and belay devices (intermediate anchorages).

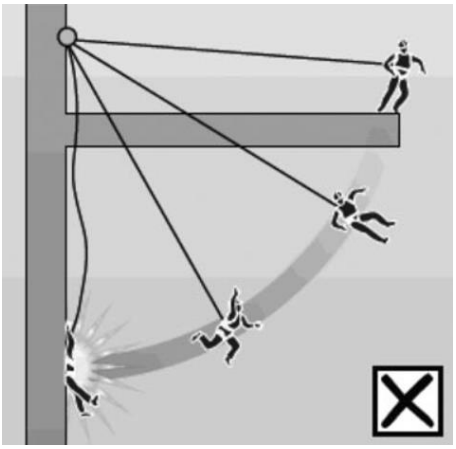


Figure 37 – Swing Back effect

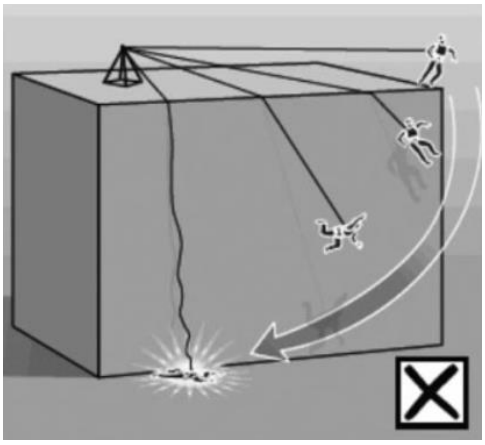


Figure 38 – Swing Down effect

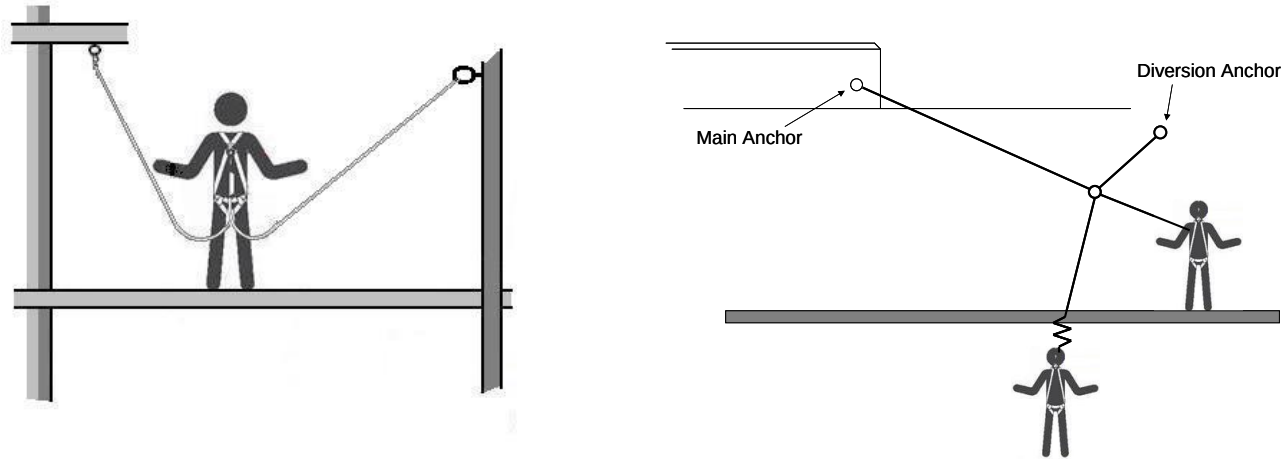


Figure 39 – Secondary anchor points – preventing pendulum effect

CHECKING EQUIPMENT BEFORE USE

Before you use any equipment (including safety equipment), tools or plant you must check that they are in safe working order.

Common faults and checklists or inspection techniques are usually outlined in your worksite policies and procedures and also in the operator's manual for each tool or piece of equipment.

The manual will contain the manufacturer's instructions and specifications for inspecting, using, cleaning, maintaining and storing the item. They will also explain its capabilities and limitations. If you find anything wrong during your checks you need to do the following:

1. Do not use.
2. Tag out and isolate to prevent use.
3. Record the problem in the log book or inspection checklist.
4. Report the fault to your supervisor or authorised person.

INSPECTING INERTIA REELS

When inspecting inertia reels make sure you check the following:

Main Body

- Examine complete body casing checking for cracks and impact damage which may affect the operation of the block
- If the block has retrieval handles check that this is attached and ratchet mechanism working

Rope

Make sure the rope can be fully extended and retracts back properly. Check the entire length of the rope for any damage;

- Abrasion.
- Fraying.
- Stretching.
- Evidence of contact with heat or chemicals.

Make sure you give the rope a firm pull while fully extended to test the rope is securely attached to the drum of the inertial reel.

Locking Mechanism and Rope Guides

Check for any wear or damage. Check that the locking mechanism is working correctly and holds securely. Check that the rope rewinds completely without loss of tension.

Attachments (karabiners, shackles, etc)

Make sure the locking action is working on these parts and that there are no signs of damage or wear.

Figure 40 – Inertia reel cut away view

GENERAL CHECKS FOR ATTACHMENT HARDWARE

Always read manufactures instructions.

- ID number present.
- Alignment of body – twisting, buckling.
- Distortion of hook or latch.
- Wear on body.
- Cracks or gouges.
- Wear at swivels and latch pivot pins.
- Gate function.
- Broken, weak or misplaced latch springs.
- Locking mechanism operates correctly.
- Free from corrosion, dirt, rust or other obstructions.

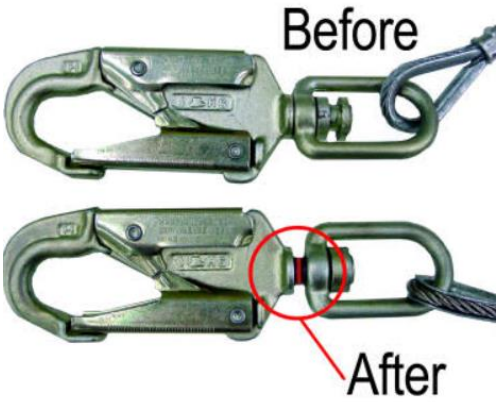


Figure 41 – Example before and after a fall (red indicator)

INSPECTING FALL ARREST HARNESSES

Any harness equipment should be checked using a detailed inspection checklist, as outlined in AS/NZS 1891.4:2009 “Industrial fall arrest systems and devices”. It is extremely important that all harnesses are checked before use.

Consider that this is one of the most important pieces of equipment in catching you if you fall. Part of your inspection must include putting the harness on and checking that it fits correctly and is comfortable. Always follow the manufacturer’s instructions for fitting the harness.

- Check all webbing for effects of cuts, tears, abrasion, heat, chemicals, corrosives or solvents, hardening, excessive stretching, glazing due to friction, excessive wear or fuzziness, discoloration due to chemical contamination or prolonged ultraviolet exposure, deterioration due to rotting or mildew, excessive stiffness due to overloading, possibly as a result of a fall.
- Check all stitch blocks for broken, cut or worn stitching and damage due to heat, corrosives, solvents or mildew.
- Check all buckles and D-rings for deformation, distortion, corrosion, wear and correct orientation.

- Check ID no and Standard Logo for legibility.
- Attachment hardware for distortion, cracks, corrosion and failure to open/close freely.
- Check Date of Manufacture – shelf life shall not exceed 10 years.
- Check for evidence of a fall. Must be withdrawn from service after a fall and destroyed if any damage has been sustained.
- Check with the user for possible causes of damage.

Figure 42 – Tear in webbing

Figure 43 – Damage from contaminates

Figure 44 – Inspection tag visible from fall

ROPES AND LINES

The relevant Australian Standard for ropes and lines is AS 4142.3 Man Made fibre rope used for Static Life Rescue.

Generally ropes can be manufactured from polyamide (nylon,) polyester, polypropylene and manila and constructed in 3-strand hawser or Kernmantle manner.

Kernmantle

Only ropes made from man-made synthetic fibres such as polyamide (nylon) or polyester are suitable as PPE. The most user friendly construction for these types of rope is known as “kernmantle”, this is where the kern is the inner core of the rope and the mantle is the outer protective sheath. The core is the major structural component of the rope.

Figure 45 – Kernmantle static line examples

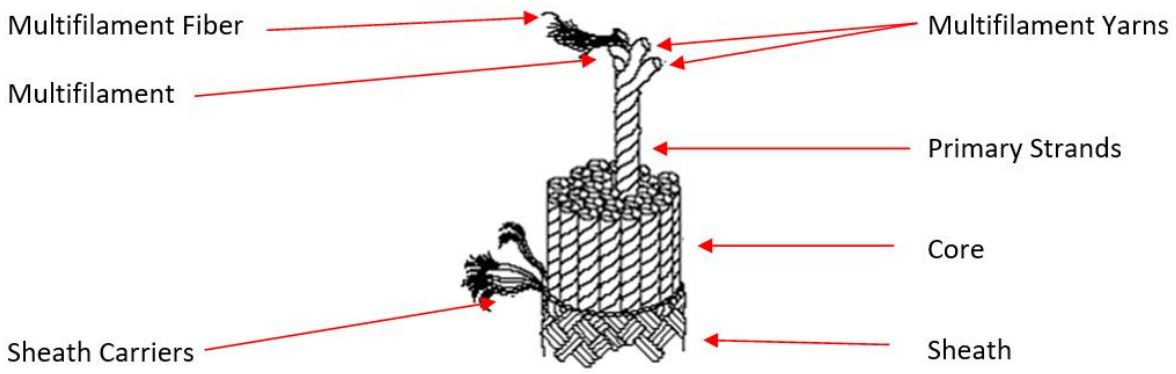


Figure 46 – Kernmantle static line construction

Static Line

Static Line, such as the Kernmantle Static Line above, is designed for use under load for extended periods. This includes descending, lifting and lowering systems and is ideal for life/rescue lines. Static Lines each contain a 3mm wide marker tape inside the lay of core stating the trademark name and the words: "FOR STATIC LIFE/RESCUE LINES"

- Minimum Diameter: 11mm
- Minimum Safe Working Load (SWL): 375kg

Dynamic Line

Dynamic Line is designed specifically for recreational climbers and to service large and repeated shock loads such as from falls. Ropes and lines to be used for this purpose should never be used for industrial or workplace situations.

Other Rope Construction

Other rope constructions, such as hawser laid rope may be used as PPE; however their handling properties and compatibility with some items of hardware are not as good as the kernmantle construction.

The only rope used in rescue operations is static life rescue line made of Kernmantle construction to AS 4142.3 or equivalent standard. Requirements under this standard are:

Strength:	3000kg (375kg Safe Working Load)
Minimum Diameter:	11mm
Design:	Kernmantle - Strand lengths in the centre (or kern) surrounded by a braided sheath (or mantle) designed for easy handling and high abrasion resistance.

IDENTIFY WORK PROCEDURES AND INSTRUCTIONS

PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE includes equipment for personal protection as prescribed under legislation, regulation and workplace policies and procedures.

PPE may include:

- Appropriate clothing such as high visibility vests or jackets so that other operators can easily see you. Safety helmet – helmets must be worn wherever there is a risk of objects falling from above and on any worksite where the hard hats sign is displayed.
- Non-slip safety footwear – choose footwear that is comfortable, gives maximum grip and provides protection from pinching, jamming and crushing.
- Eye protection, e.g. goggles – wear eye protection if you are likely to be exposed to:
    - Physical damage,
    - Chemical damage, and
    - Radiation damage.
- Ear protection – this must be worn where there is a high volume of noise.
- Gloves – wear close fitting gloves to protect your hands from:
    - Heat and abrasion, and
    - Sharp edges.
- Respiratory protective devices – may be needed if your work exposes you to:
    - Toxic gases and vapours, and
    - Irritating dusts, such as silica.

To prevent permanent damage caused by ultra violet rays always wear a hat (with broad brim attachment), long sleeves, long trousers and use sunscreen when working outside.

Figure 47 – Warning sing examples

Figure 48 – PPE examples

PERIMETER GUARD RAILS

An edge or perimeter protection system (guard rails) are barrier placed around the edge of a structure, building or gap to prevent people and/or objects from falling over the edge of a working surface. It can include handrails, guardrails, mid-rails and kickboards (toe boards) or containment sheeting.

The “Managing the risk of falls at workplaces” Code of Practice states that guard rails should be used:

- 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.

Handrails, mid-rails and kickboards (toe boards) should not be further than 100mm outside the edge of the working surface they run parallel to.

The guard rail must be placed at a height of 900mm to 1100mm above the working surface with the mid-rail secured halfway between the guardrail and the working surface. The kickboard must be fixed to the working surface and should extend at least 150 mm above it.

Figure 49 – Roof edge protection

FALL PROTECTION COVERS

Fall protection covers are usually made of timber, metal or wire mesh. They are placed over openings and holes such as skylights to prevent falls. They should be securely fixed and strong enough to take the impact of a falling person.

Signage should be used in conjunction with a fall protection cover to warn people that there is an opening or hole underneath.

Figure 50 – Timber hole cover

Figure 51 – Mesh hole cover

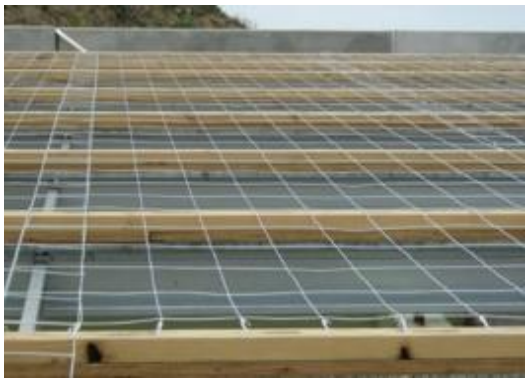
SAFETY MESH

Safety mesh is designed to prevent internal falls through a roof.

When correctly installed, safety mesh provides fall protection for roof installers, maintenance and repair workers.

It is important to note that safety mesh does not prevent falls from the edge of a roof, or through holes in a roof. Safety mesh should always be used with other fall prevention systems and equipment such as edge protection, guard rails or fall-arrest systems.

Safety mesh should comply with AS/NZS 4389:2015 - Safety mesh. Safety 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.



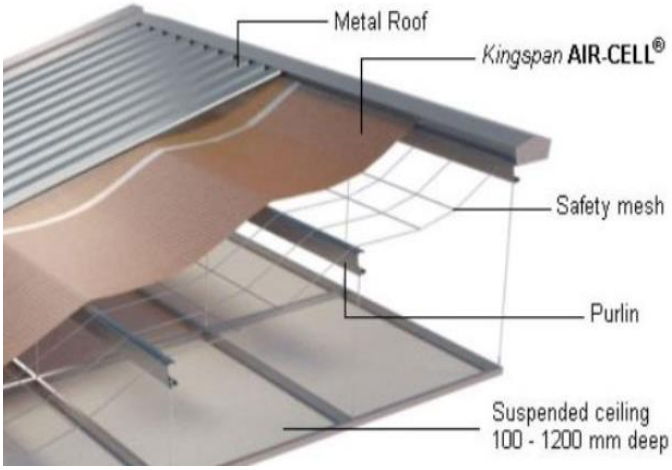


Figure 52 – Roof safety mesh

CATCH PLATFORMS AND SAFETY NETS

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.
- Always be used with an adequate form of edge protection.

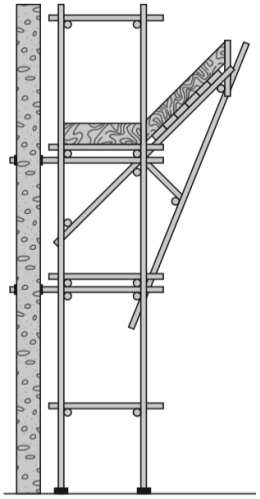
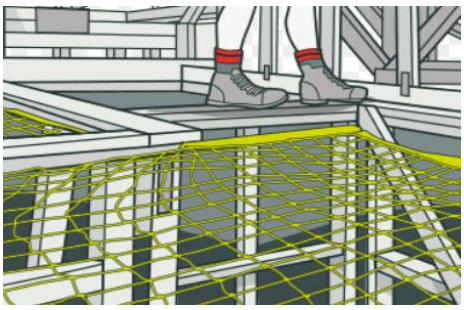


Figure 53 – Catch platform

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.



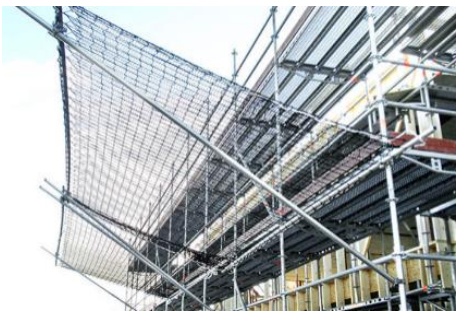


Figure 54 – Safety nets

HANDLING AND SECURING EQUIPMENT AND MATERIALS

When you are moving or using materials and equipment always make sure you follow the requirements for manual handling to prevent injuries to yourself and others. You should avoid excessive bending or twisting. Attempting to move heavy or awkwardly shaped loads may lead to losing your balance, resulting in a fall.

Wherever possible, use other means of moving tools and equipment, up to and around the work area.

For example:

- Team lifts.
- Conveyors.
- Elevating work platforms.

Be particularly careful when carrying materials on ladders. Only one person should be on a ladder at a time. While on a ladder you should have three points of contact, i.e. two feet and one hand or one foot and two hands, on the ladder at all times.

Make sure when you are moving tools and equipment around your work area that potential hazards, such as dropping them over edges, are minimised.

This could be done by:

- Securing tools and equipment to a belt (using a lanyard).
- Hoisting materials and equipment up separately.
- Making sure that catch platforms and safety nets are in place before moving tools, equipment and materials to the work area.

Tools, equipment and materials should be placed or installed in the work area in a way that will eliminate or minimise the risk of them being knocked down.

For example:

- Keep tools and materials away from unprotected edges.
- Make use of lanyards while using hand tools.
- Store unused tools and equipment in a toolbox or container.

Figure 55 – Wrist Strap and Tool Belt

SIGNS AND BARRICADES

As part of your control measures it is essential to warn others in the work area of activities taking place.

Some options available are:

- Tool box talks / communication
- Erection of warning signs on all access points
- Erection of hard barricades;
    - Bollards.
    - Mesh Fencing.
    - Netting.

The area to be barricaded off must be sufficient to cover the danger area and drop zone of tools and equipment.

Figure 56 – Barricade and Warning Signs

FALL PREVENTION DEVICES

Fall prevention devices provide the best protection against falls by working to minimise the chance of a fall ever occurring, not allowing the worker to get into a position where a fall is possible.

Figure 57 – Fixed static line on roof

Figure 58 – Fixed static line

LIFE LINES AND STSTIC LINES

Life lines and static lines are horizontal or substantially horizontal lines to which a lanyard may be attached and which is designed to arrest a free fall.

These provide a suitable anchor point for a fall-arrest system, while still allowing a limited range of movement along the path of the line.

These lines must be installed and checked regularly by a competent person and must only be used in accordance with the manufacturers specifications, including limits relating to the number of workers connected to the line at one time.

Wherever possible life lines and static lines should be as high as the situation safely allows to limit the free-fall distance of workers connected to it.

Life and static line anchors must be rated appropriately for the situation and number of workers.

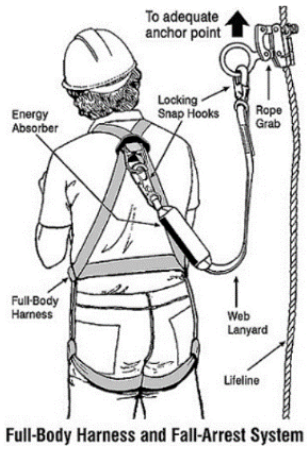


Figure 59 – Fall arrest system connected to a static line

Figure 60 – Static line examples

EMERGENCY PROCEDURES

Emergencies can happen quickly and without warning when work is being done at heights. If all necessary precautions, hazard control measures and safety equipment have been used then the risk of serious consequences is reduced.

However you should always be prepared to take action in an emergency situation, even if that action is as simple as calling for help.

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

Relevant consideration	Questions
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 manmade 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?

Table 4 – Emergency procedure considerations

SUSPENSION INTOLERANCE

Suspension intolerance 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.

Figure 61 – Worker suspended from centre after fall

Signs and Symptoms of Suspension Intolerance

- Faintness.
- Breathlessness.
- Sweating.
- Paleness.
- Nausea.
- Dizziness.
- Low blood pressure.
- Unconsciousness.

Preventing Suspension Intolerance

The following techniques can be used to help prevent suspension intolerance in a person who is hanging in a fall arrest harness:

- Never work alone when using a harness as fall protection.
- Wherever possible use a fall arrest harness that allows legs to be kept horizontal.
- If possible keep the time a worker spends in suspension after a fall limited to less than five minutes. This can be achieved by providing foothold straps or a way of placing weight on the legs should be provided.

If you find yourself in a situation where you are suspended in a fall arrest harness after a fall attempt the following action:

- Move your legs in the harness and push against any footholds to relieve pressure on your upper legs.
- Move your legs as high as possible and tilt back so that you become as horizontal as possible.

If a worker has fallen and is hanging suspended in a safety harness for a prolonged period of time (5 to 30 minutes) it is absolutely vital that first aid procedures are implemented as quickly as possible.

For this reason, workers should be capable of conducting a rescue of a fallen worker and be familiar with onsite rescue equipment and procedures.

Figure 62 – Harness with leg loop to relieve pressure

First Aid for Suspension Intolerance

In accordance with Australian Resuscitation Council (ARC) guideline 9.1.5, first aid management of suspension intolerance should be carried out as follows:

1. Call for an ambulance (dial 000).
2. If unconscious, manage the victim according to basic life support principles. If conscious, rest the victim in a comfortable position, ideally lying down, and provide reassurance.
3. Loosen or remove the harness.
4. Administer oxygen if available.
5. Look for and manage associated injuries in the victim, especially if they have fallen or been electrocuted.
6. Monitor the signs of life at frequent intervals.

Remember, care of the airway takes precedence over any injury.

REPORT ALL HAZARDS, INCIDENTS AND INJURIES

Depending on the nature and severity of the situation you may need to report to:

- Your supervisor.
- Emergency services, e.g. police, ambulance, fire brigade and emergency rescue.
- WHS regulatory authority, e.g. SafeWork NSW.

Ask your WHS officer or site supervisor for the relevant forms and procedures for reporting hazards, incidents and injuries. Incident reports should be available for recording the details of incidents in the workplace.

Figure 63 – "Gotcha" rescue kit

Figure 64 – "Gotcha" rescue kit in use

ACCESS AND INSTALL EQUIPMENT

INSTALLING SAFETY SYSTEMS AND EQUIPMENT

All safety systems and equipment must be installed and regularly checked by a competent person. In some cases this is a person qualified with a scaffold or rigging High Risk Work Licence.

INSTALLING FALL-ARREST SYSTEMS

Fall-arrest systems require a high degree of planning, training and supervision and rely heavily on workers always doing the right thing and not taking short cuts.

For these reasons, they should only be used where none of the other methods are practicable.

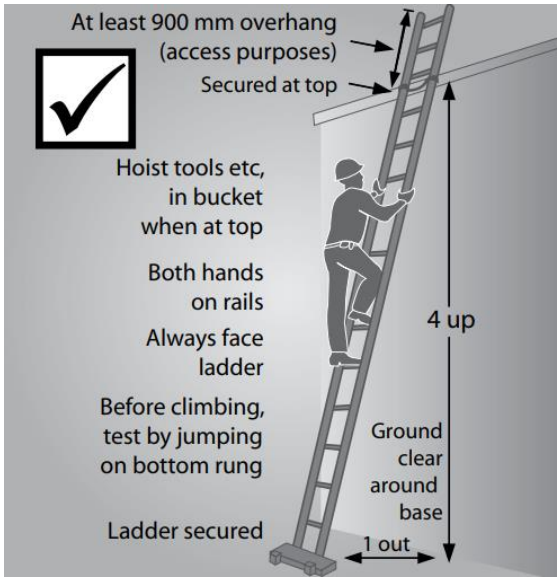
Each safety line system is designed and installed based on the number of people connected to the line at any one time, and also takes into account the use of regular or energy absorbing lanyards.

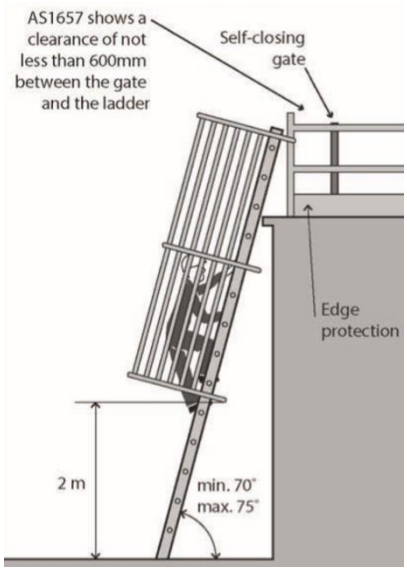
LADDERS

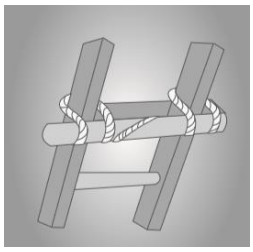
Ladders should generally only be used as a means of access to or egress from a work area. They should only be used as a working platform for light work of short duration that can be carried out safely on the ladder. Ladders should not be your first option for conducting work at heights as Elevating Work Platforms or scaffolds are a safer and more efficient option.

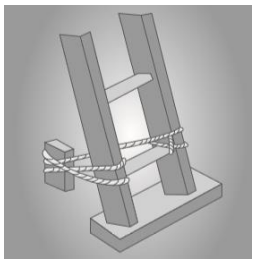
Where fixed or extension ladders are used for access or egress, you should check that:

- There is a firm, stable 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.
- Fall protection is provided at the stepping-off point where people access the working platform.









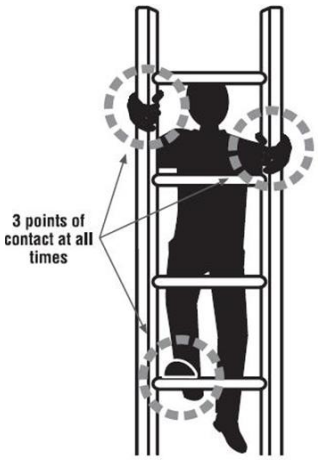


Figure 65 – Ladder access examples

Using Portable Ladders to Gain Access

Ladders should be installed so that:

- They are on stable ground and secured against movement both at the top and base.
- Step ladders are fully opened with spreaders locked into position.
- Only approved attachments are used.
- Extend at least one metre above the access level.
- Metal ladders are not to be used where there are electrical hazards.
- Single and extension ladders are placed at a slope ratio of 4 vertical to 1 horizontal (4:1).
- They are not used on working platforms or scaffolds to gain extra height.

Only light duty work should be undertaken while on a ladder, where three points of contact can be maintained and tools can be operated safely with one hand. Depending on the type of work you may be required to use a fall prevention system that is connected to a ladder.

Portable ladders are available in two grades – industrial and domestic. All work carried out at heights should use a ladder that is rated to 120kg and is manufactured for industrial use. Never use a domestic grade ladder for industrial use because it is not required to be as robust and strong as an industrial grade ladder.

When selecting a ladder for use, make sure it is in good condition. Check for faults, such as broken rungs, stiles and footing before you use it.

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 66 – Portable ladder examples

Inspecting Ladders

It is vital that you only use ladders that are in good working order.

Do not use a ladder with any of the following faults:

- Timber stiles are warped, splintered, cracked or bruised.
- Metal stiles are twisted, bent, kinked, crushed or with cracked welds or damaged feet.
- Rungs, steps, treads or top plates are missing, worn, damaged or loose.
- Tie rods are missing, broken or loose.
- Ropes, braces or brackets are missing, broken or worn.
- Timber members (apart from narrow identification bands) are covered with opaque paint or other treatment that could disguise faults in the timber.

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, workboxes, 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

When using scaffolding make sure that:

- Any scaffold from which a person could fall more than 4 m is prepared and erected by a licensed scaffolder.
- It complies with Australian Standards AS/NZS 1576.1:2010 and AS/NZS 1577:2013
- It is equipped with guardrails and kickboards (toe boards).
- Mobile scaffolding is level, the wheels/castors are locked while in use, they are positioned safely away from any edges that may collapse under the weight of the scaffold and equipment, and they are not moved with someone on it.

Whenever you are working on a scaffold make sure you work in accordance with site procedures and the manufacturer's specifications. Also ensure you know the capacity of the scaffold and that it is completed (by viewing the scaffolding tag) and ready for use.

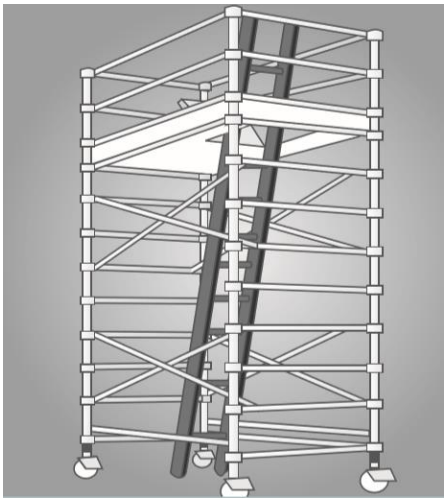


Figure 67 – Internal ladder on mobile scaffolding

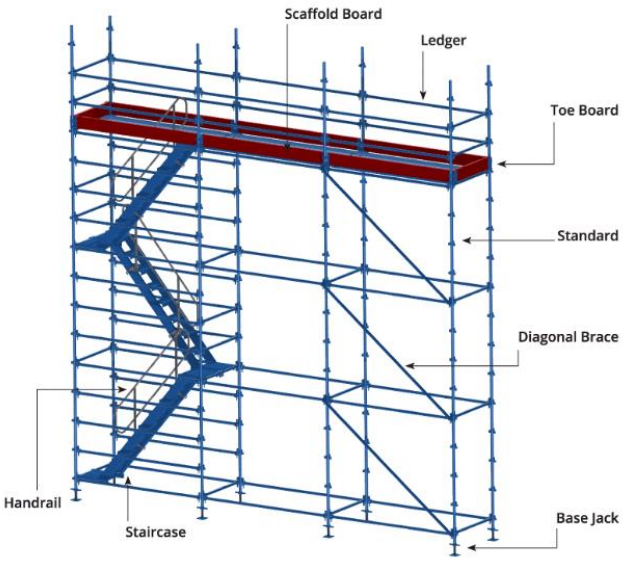


Figure 68 – Internal stairs in scaffolding

Elevating Work Platforms (EWPs)

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.

When using a EWP it is important 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 Cranes, hoists and winches – Safe use – Mobile elevating work platforms 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 that could cause uncontrolled movement or overturning of the platform.
- 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.
- Workers are licensed when operating boom-type elevating work platforms with a boom length of 11 metres or more.

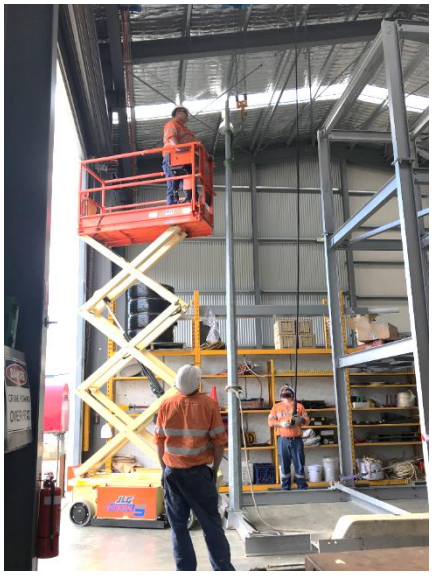


Figure 69 – EWP Scissor Lift

Figure 70 – EWP Boom Lift

Workboxes

A workbox 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. It consists 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 workbox.

The safety requirements and considerations include that:

- The workbox is not suspended over persons.
- The workbox 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 workbox 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 within the workbox 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 stabilised at all times while the workbox 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 is to be used while a workbox is in use.
- An effective means of communication between any person in the workbox and the operator is provided.
- The crane is fitted with a safety hook and moused (lashed) accordingly.
- The operator remains at the controls of the crane at all times.

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

Figure 71 – Work Box suspended by crane

Forklifts with a work box

A workbox 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.

Safety considerations include that:

- People are not raised on the tines of forklift trucks or the pallet.
- No other device (for example, ladder or pallets) is used to gain additional height.
- The safety gate is self-locking and kept shut when in the elevated position.

Figure 72 – Forklift Work Box Do & Don’ts

Mast Climbing Work Platforms

Mast climbers are made up of work platforms that are raised and lowered along 1 or more masts using a hoist mechanism.

In some instances as prescribed by the manufacturer, they may need to be tied to a building to make sure they remain stable during use.

Mast climbers are not suitable for use if the profile of a structure changes at different elevations (e.g. if the upper floors of a building 'step' back or balconies extend from the building).

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

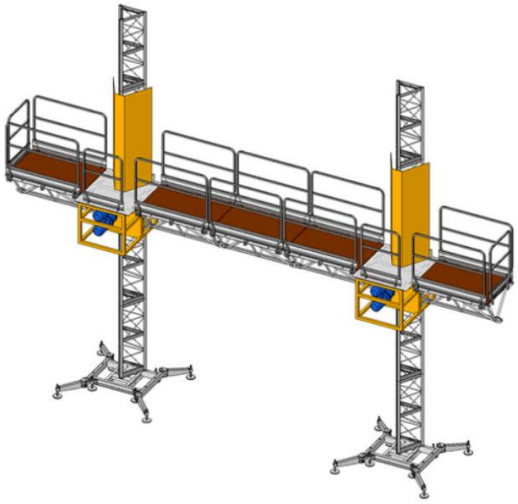


Figure 73 – Dual Mast Climber

Figure 74 – Single Mast Climber

WORK POSITIONING SYSTEMS

A work positioning system uses equipment to allow a worker to carry out a task while being supported in a harness (in tension) to prevent a fall.

This can include:

- Restraint systems – these make use of a lanyard and an anchor point or horizontal life line (static line).
- Industrial rope access systems – these allow a worker to be vertically suspended to access a work area (such as the side of a building).

It is always better to prevent the possibility of a fall than simply providing a fall arrest system because of the serious dangers resulting from a worker being suspended in a harness for too long before rescue (e.g. suspension intolerance).

Due to the high level of competency required it is recommended that users, including supervisors, should undertake a competency based course of training.

Figure 75 – Work positioning systems

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. Other methods of reaching the work area should always be considered before using an industrial rope access system such as scaffolding, EWP's etc.

The code of practice "Managing the risk of falls at workplaces" states that when using an industrial rope access system you must ensure that:

- 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.
- 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 tradespeople.

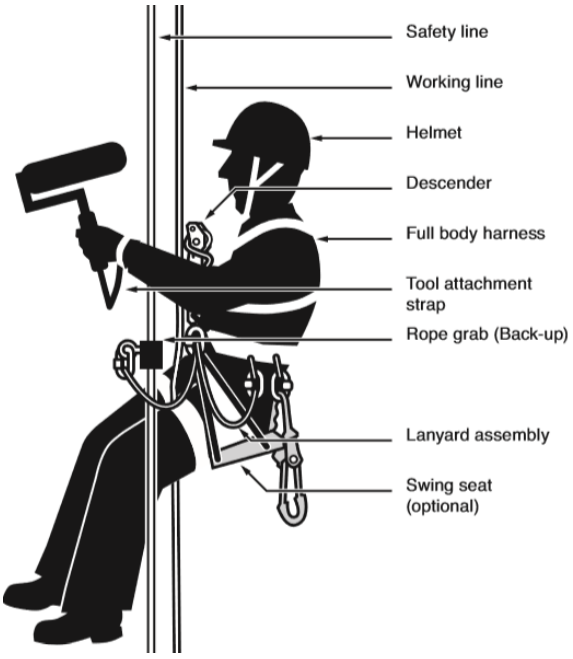


Figure 76 – Rope access system

TOOLS AND EQUIPMENT

If the correct equipment has been selected for use this occurrence should be limited. Some considerations are:

- Drop zone established and clear.
- Use of lanyards of tools.
- Toll belts.
- Tool bags.
- Using hoists to move equipment separately.
- Security of equipment whilst being moved.
- Storage bins.
- Toes boards.

Depending on the amount of tools and equipment this may take several movements.

Figure 77 – EWP Platform showing Toe Board

Figure 78 – Tool belt with lanyards on tools

PERFORM WORK AT HEIGHT

It is essential that all work done at heights is conducted safely at all times, in accordance with WHS requirements and the safe working practices of your worksite. Dangerous situations can arise very quickly, sometimes with tragic consequences.

When working at heights:

- Make sure that the work area is kept clean and tidy.
- Rubbish should be removed regularly in a safe manner.
- Do not throw rubbish down from the work area to the ground.
- Keep access ways clear of materials, tools and equipment.
- Be careful of hazards such as clothing catching on objects and structures.
- Also take care when working on fragile roofing.
- Always use walkways or planks when moving around and stay in designated work areas.

SAFELY ACCESS WORK AREA

Once you have selected and inspected the tools and equipment for your work, and checked that the appropriate safety system has been safely installed and fitted you will need to access the work area and install the equipment to perform your work at heights.

You need to check the access from the ground to your work area to make sure it is safe, free of obstructions and meets all safety and work requirements.

Do not remove scaffold components when accessing a work area.

CONNECTING TO THE FALL-ARREST SYSTEM

Anchor points and static lines should be installed to allow workers to safely connect before coming too close to an unprotected edge.

Make sure all safety catches are properly connected to anchor points and that only the allowable number of people is attached to the fall-arrest system.

COMMUNICATION TECHNIQUES AND EQUIPMENT

Workers should never operate alone at heights. If a worker were to fall from a roof or structure while alone there would be no one there to implement emergency procedures. The fallen worker may have injuries that prevent them from getting help on their own or they may be left suspended in a safety harness. It is therefore important to work with others using effective communication skills.

Effective communication skills include:

- Clear and direct contact.
- Effective listening and questioning to identify and confirm requirements.
- Sharing information.
- Using appropriate language and concepts.
- Using and interpreting non-verbal communication, e.g. hand signals.
- Effective use of technology, such as two-way radios and mobile phones.

You will also need to familiarise yourself with all relevant construction terminology relating to your tasks while working at heights. This will help you to understand all job requirements and enable you to communicate confidently with other workers.

Using Radios and Mobile Phones

Two-way radios and mobile phones are commonly used for work at heights. The transmitting frequencies of the equipment must be selected to prevent interference to or from other radio or phone equipment being used in the area. It is important that the two-way system provides clear signals without any interference on the channel.

The two types of two-way radio are:

Conventional radio – Great care must be taken when allocating frequencies/channels to make sure that there are no other operators using the same frequency in the area.

Trunked radio – Trunked radios are able to block any other radios in the area from using the same frequency. This is recommended for large worksites. With trunked radio it is possible to have several separate groups on one site communicating by radio without interfering with each other.

Because you should never work at heights in isolation you need to make sure all equipment is working properly and that you can communicate with other workers clearly.

Do not use any communication equipment that is not consistently working properly.

MONITORING OF SAFETY SYSTEMS

It is important that all safety equipment is monitored and checked regularly to ensure it is still an effective control measure for preventing injuries caused by falls.

Each component of the safety system, including its attachment to an anchorage, must be inspected by a competent person:

- After it is installed but before it is used.
- At regular intervals in accordance with workplace procedures.
- Immediately after it has been used to arrest a fall.

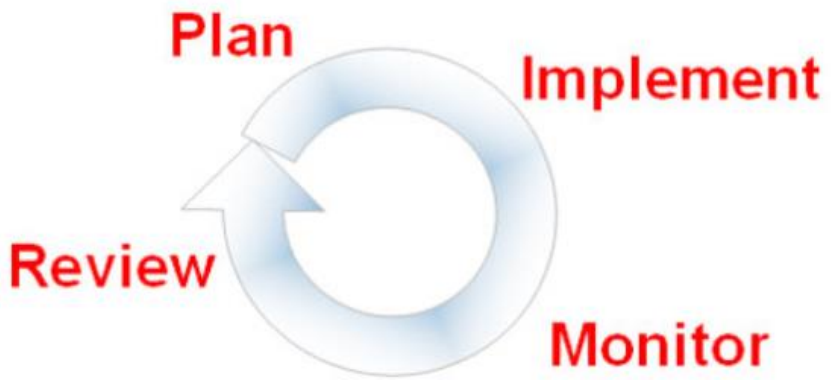
Inspection of the system and its components should be conducted in accordance with the manufacturer's specifications and the relevant standards (e.g. AS/NZS 1891).

If any faults, signs of wear or weakness are found during the inspection, the system should be removed from use until corrective action can be taken, such as replacing defective or worn components.

Never use a fall-arrest system that is faulty in any way!

MONITORING AND ADJUSTING RISK TREATMENTS

Monitoring the existing risk control treatments, that are in place means, checking to ensure they are effective and appropriate to the task and the work environment. These risk control measures may need to be reassessed and adjusted if work practices and/or site conditions change and new hazards are identified.



CLEAN UP WORK AREA

FINALISE OPERATIONS

Once you have finished the work at heights you must check your work instructions to make sure everything has been completed, and to see if there are any further tasks that need to be taken. For example you may need to dismantle equipment or remove materials from the work area.

DISMANTLING SAFETY SYSTEMS

Safety systems such as static lines, falls arrest harness and safety nets should be dismantled according to the correct sequence and procedures. They should then be removed from the work area.

If they are no longer necessary, risk/hazard control measures such as barriers and signs should be removed, cleaned and stored away. Make sure this equipment is dismantled according to manufacturers' specifications.

Continue to work safely at heights while equipment is dismantled. Work methodically and follow site procedures, using safety equipment at all times. During the disassembly process you need to maintain the stability of all structures and plant. Unplanned collapse can result in serious injuries to personnel and damage to equipment and materials.

CLEAR WORK AREA AND STORE TOOLS AND EQUIPMENT

When your tasks are completed or if the work area is being left unattended, you need to make sure it is adequately cleared and cleaned up.

CLEARING THE WORK AREA

Follow worksite procedures and wear the appropriate PPE to recover and remove tools, equipment and materials from your work area, exiting the site in a safe manner.

Litter and other building debris can cause a tripping hazard for personnel as well as having a negative impact on the environment. You will need to make sure all rubbish is collected and disposed of correctly. This includes the disposal or recycling of waste materials in accordance with the project environmental management plan.

CHECKING AND STORING OF TOOLS AND EQUIPMENT

Tools, equipment and plant need to be cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and your company's policies and procedures.

This will involve:

- Firstly, cleaning the tools and equipment to remove all dirt, mud, moisture or other contaminants, following manufacturers' specifications. Doing this first will make it easier to identify and damage in the following step.
- Checking for any damage. If any damage is found:
    - do not use,
    - tag out of service,
    - report it, and
    - then, if possible, carry out any repairs.

- Maintenance is to be conducted in line with manufacturers' recommendations or your worksite policies and procedures. This may include oiling of timber surfaces, greasing of metal surfaces or lubricating moving parts.
- Correctly store tools and equipment. Most equipment, plant and tools will have designated storage instructions to ensure the items are kept free from damage and can be readily found the next time they are needed.

For any damaged or defective tools and equipment:

- Do not use.
- Tag out of service and isolate to stop anyone else using them.
- Record the issue in a logbook or inspection checklist.
- Report the issue to a supervisor or other authorised person.

Figure 79 – Lock out tag example