+IMPAC | The Health + Safety Company

RISK MANAGER
CONSULTING
PREQUAL
TRAINING
VRCOMPETENCY
TALENTBANK
SAFEWORX

WORKING AT HEIGHTS

+IMPAC The Health + Safety Company

We're IMPAC – the Health + Safety Company, proudly New Zealand owned and operated since 1999.

As NZ's leading full-service H+S solutions provider, we have unrivalled experience and expertise at getting the best possible H+S outcomes for our clients. We work alongside them to become true partners, to fully diagnose their needs and deliver solutions to keep their teams safe.

We partner

We diagnose

We deliver

We're here to help.

0800 246 722 | contactus@impac.co.nz | www.impac.co.nz

CONTENTS

TRIGGER WARNING

IMPAC is committed to creating an inclusive and safe learning environment. Before we begin, it is essential to recognise that training often involves discussing topics that may be sensitive or evoke emotional responses. It is important to be aware that the content during this course may include discussions of potential hazards, incidents, or scenarios.

If you find any part of this course triggering or if you have concerns, please reach out our team for support or alternatively access the resources available on our website: https://impac.co.nz/training/student-health-and-wellbeing/

Remember, if at any point you need to step away or take a break, please do so your wellbeing is our priority.

© IMPAC

TIPS

This handout is designed to go with an IMPAC training experience. You will need to refer to it during the training. It is yours to take away and also makes a great reference guide back in the workplace.

Please feel free to add your own notes to this handout.

As you go through this handout with your trainer use a highlighter or underline important words as you are reading. This will make it easier to find key information later.

Use a different colour to highlight or underline words you do not understand or are unsure about, this will make it easier to find them later so that you can ask someone, or look them up.

IMPAC POLICIES

The following IMPAC's policies and process are available in IMPAC's Learner Handbook

- Complaints process
- NZQA Assessment process
- Appeals process.

The IMPAC Learner Handbook is available to download on IMPAC's website, Learning Management System and can be emailed on request.

© IMPAC

THE IMPAC HEIGHT SAFETY COURSE

Acquire a thorough grasp of the legal obligations and effective management techniques for proprietary height safety systems and protocols.

It also provides the training required towards the achievement of:

NZQA Unit Standard 15757 — Use, install and disestablish temporary proprietary height safety.

NZQA Unit Standard 17600 - Explain safe work practices for working at heights.

NZQA Unit Standard 23229 - Use safety harnesss system when working at height.

NZQA Unit Standard 25045 - Employ height safety equipment in the workplace.

As an NZQA candidate, you are expected to:

Participate fully in the training session, discussions and activities

Share your knowledge and experience

Complete all assessment activities as notified by your trainer

Take responsibility for your own learning needs

Discuss with your trainer any assistance you may need.

If you are being disruptive, your trainer will advise you that your behaviour is disrupting learning for other trainees.

If the behaviour continues to disrupt or disturb others, your trainer will ask you to leave the course, and your employer will be notified immediately.

© IMPAC

INTRODUCTION

INTRODUCTION

Terminology:

TERM	MEANING
PCBU	Person conducting a business or undertaking.
Upstream PCBU	Designer or a supplier
Reasonably Practicable	Something that is reasonably able to be done to ensure health and safety.
PPE	Personal Protective Equipment
HSWA 2015	Health and Safety at Work Act 2015
AS/NZS	Joint Australian New Zealand Standard
GPG / BPG	Good Practice or Best Practice Guidelines
Construction Work	• Means any work in connection with the alteration, cleaning, construction, demolition, dismantling, erection, installation, maintenance, painting, removal, renewal, or repair, of - ° Any building, chimney, edifice, erection, fence, structure, or wall, whether constructed wholly above or below, or partly above and partly below, ground level. ° Any aerodrome, cable-way, canal, harbour works, motorway, railway road, or tramway. ° Anything having the purpose of drainage, flood control, irrigation, or river control. ° Any distribution system or network, having the purpose of carrying electricity, gas telecommunications, or water. ° Any aqueduct, bridge, culvert, dam, earthwork, pipeline, reclamation, reservoir, or viaduct. ° Any scaffolding

© IMPAC

Restrained Fall	A fall or the arrest of a fall where the person suffering the fall is partially restrained by a device such as a pole strap or is sliding down a slope on which it is normally possible to walk without the assistance of a handrail or hand line.
Free Fall	Any fall or part of a fall more than 600 mm either vertically or on a slope on which it is not possible to walk without the assistance of a handrail or line.
Limited Free Fall	A fall or the arrest of a fall occurring less than 600mm
Fall Restraint	Physically prevent the person from reaching a position at which there is a risk of a free or limited free fall.
Kilonewton (kN)	A kilonewton is the general unit for the measurement of force and strength. A newton is the amount of force required to accelerate a body with a mass of one kilogram at a rate of one metre per second squared. A kilonewton is a thousand of these units. As an approximation 100 kg hanging at rest on a line will exert a force of 1 kN on the anchor.
Static Line	In relation to fall protection, means a rope, wire strop, or rail secured between two points and possibly at various points along its length in order to support anchor lines, fall arresters or other fall protection devices. It shall have a minimum breaking strength of 44 kN.
Prescribed Systems	A prescribed system is a lifeline that is designed and installed in accordance with AS/NZS 1891.2 Supp 1:2001. The end anchor loadings on these systems may reach up to 63.3 kN.
Propriety Systems	A proprietary system is a lifeline that is designed and installed in accordance with a manufacturer's specification. These systems usually include shock-absorbing components that reduce the end anchor loadings of the lifeline.
Unprotected edge (or sides)	Any edge or side (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no guardrail system or barrier preventing a person reaching or falling over an exposed edge.

© IMPAC

INTRODUCTION

In most industries when working at heights, falls are responsible for deaths and life altering injuries. Even a fall from as little as 1 metre can be fatal. Fall protection can minimise the risk of injury from a fall, but only if it is used and maintained properly.

Definition of 'Working at Height' and the possible risks.

- Working at a place above or below ground where a person could be injured in they fell from one level to another - from any height.
- Work at height does not include slipping, tripping, or falling at the same level.
- Work carried out where falls of three metres or more may occur.
- High Risk activity - where incidents can lead to serious harm, e.g. broken bones, disability, death caused by falls, harness suspension, pendulum effect.

How can we define a fall?

- Falling off, over an edge.
- Falling through a roof structure.
- Falling into a vessel or trench.

If there is potential for a person to fall - all reasonably practicable steps must be taken to prevent harm.

Preventing falls from height is a priority for WorkSafe New Zealand (WorkSafe). WorkSafe expects that work at height is actively managed, so people are not harmed.

Investigations by WorkSafe NZ into falls while working at height show that more than 50 per cent of falls are from less than three metres and approximately 70 per cent of falls are from ladders and roofs.

© IMPAC

Contributors to injuries resulting from working at heights include:

- Not enough planning or checking for risks
- Not enough people watching over the work
- Not being trained well enough for the job
- Choosing the wrong safety gear or tools
- Using safety gear or tools the wrong way
- Not wanting to change how a job is done, even if there's a safer way
- Not having the right tools available
- Working in bad weather conditions, like strong wind / heavy rain
- Physical and mental tiredness which can lead to mistakes

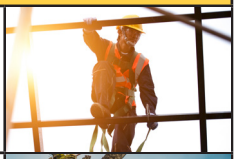
How long does it take to fall?

Many workers believe that they have time to regain their balance before they fall. This is not always true. The following table indicates how far you can fall in just a few seconds

Time (seconds)	Distance (metres)
0.5	1.2
1	5
1.5	11
2	20
2.5	31
3	44
4	78

You may not have time to grab hold of something safe, but you can still prevent a tragedy. A properly maintained safety belt or full body harness attached to a secure anchor could save your life. Your safety headgear is less likely to fall off if you are using a chin strap.

© IMPAC

TYPES OF WORKING AT HEIGHTS ACTIVITIES			
Cleaning		Building Inspection	
Surveying Plant		Arboriculture	
Pole / Line Work		Maintenance	

NOTES

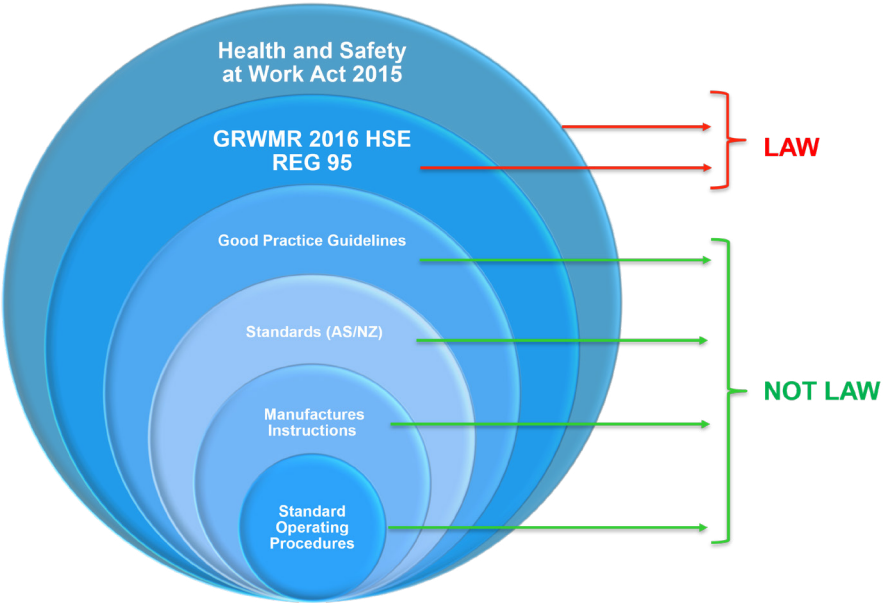
© IMPAC

LEGISLATION AND SUPPORTING DOCUMENTS

On 4 April 2016, the Health and Safety at Work Act (HSWA 2015) came into force, bringing new responsibilities for managing work related risks that could cause injury. Under this law everyone in the workplace has duties and responsibilities.

You can shift responsibilities but not accountability.

In terms of fall arrest, height work and associated activities, there are duties for certain duty holders under the HSWA 2015.



LEGISLATION (DUTIES AND RESPONSIBILITIES)

Legislative Requirements	PCBU's duties and responsibilities
Hazard Identification and control (HSWA Sec. 36 and HSE Reg. 5 & 6)	Must take all reasonably practicable steps to ensure that hazards and risks has been eliminated or minimised.
If a worker is required to work above 3 meters (HSE Reg. 21)	Must provide the worker with protection and the protection must be fit for purpose.

© IMPAC

Legislative Requirements	PCBU's duties and responsibilities
Training and Supervision (HSWA Sect. 36 (3) (f)) (GRWM Reg 9)	Must ensure that workers who must perform tasks at work has the required training, information, instruction, or supervision.
Provide Personal Protective Equipment (GRWM Reg. 15) (HSWA S 27(2))	The PCBU must supply the workers with PPE required to carry our tasks.

Legislative Requirements	Worker's duties and responsibilities
Training and Supervision (HSWA S 3 (d)	Must ensure that they are trained for the task that they need to perform.
Instructions given from PCBU (HSWA S 45 (c))	Worker must comply as far as reasonably able to allow the PCBU to comply with the law and keep the worker safe.
Company Policies and Procedures (HSWA S 45 (d))	Co-operate with any reasonable policy or procedure of the PCBU relating to health or safety at the workplace that has been notified to workers.
Keep yourself and others safe (HSWA S 45 (b)) (GRWM Reg 1)	The worker must as far as reasonably practicably look after their own health and Safety and that of others.

Legislative Requirements	Suppliers/Manufacturers duties and responsibilities
Products that are manufactured (HSWA S 40)	Must ensure that workers who must perform tasks at work has the required training, information, instruction, or supervision.
Products designed to be used in a workplace (HSWA S 39)	Tested so they are safe for use in a workplace.
Information must be supplied with the product (HSWA sect 42 (4))	Provide a purpose or intended use, how to use it safely, handle it, store it, inspect it, clean it, maintain it, and repair recommendations.

© IMPAC

NOTIFICATION OF PARTICULAR HAZARDOUS WORK

Regulation 26 of the Health and Safety in Employment Regulations 1995 requires PCBUs as well as the person who controls a place of work to provide at least 24 hours' notice to WorkSafe NZ of particular hazardous work (as defined on next page).

Notifications of hazardous work assist WorkSafe's workplace health and safety services to plan workplace visits to promote the prevention of harm to all persons at, or in the vicinity of, a place of work.

Notify WorkSafe via online form at **https://forms.worksafe.govt.nz/hazardous-work-notification.**

NOTIFIABLE WORK AS DEFINED BY THE REGULATIONS

Below are situations that require WorkSafe NZ notification when working at height.

- Any restricted work, as that term is defined in Regulation 2 of the Health and Safety in Employment (Asbestos) Regulations 1998.
- Any logging operation or tree-felling operation, being an operation that is undertaken for commercial purposes.
- The erection or dismantling of scaffolds from which a person could fall five metres or more.

© IMPAC

✚ Any construction work of one or more of the following kinds;

• Work where workers could fall five metres or more, excluding:

  ° Work on a two-storey house.
  ° Work on a power line or telephone.
  ° Work carried out form a ladder only.
  ° Maintenance or repair work of a minor or routine nature.

✚ Work using a lifting appliance where the appliance has to lift a mass of 500 kilograms or more a vertical distance of 5 metres or more, other than work using an excavator, a fork-lift, or a self-propelled mobile crane.

✚ Work in any pit, shaft, trench, or other excavation in which any person is required to work in a space more than 1.5 metres deep and having a depth greater than the horizontal width at the top.

✚ Work in any drive, excavation, or heading in which any person is required to work with a ground cover overhead.

✚ Work in any excavation in which any face has a vertical height of more than 5 metres and an average slope steeper than a ratio of 1 horizontal to 2 vertical.

✚ Work in which any explosive is used or in which any explosive is kept on the site for the purpose of being used.

✚ Work in which any person breathes air that is or has been compressed or a respiratory medium other than air.

© IMPAC

SUPPORTING DOCUMENTATION

The Legislative documents related to work activities are covered by Acts and regulations, this gives you the information on what must be done in the workplace and who must do it. Information on 'how to do', or what is a reasonably practicable step to take in order to do it safely can be found in the following documents:

- Approved codes of Practice.
- Standards (AS/NZS).
- Best (Good) Practice Guidelines.
- Manufacturers' Instructions.
- Standard Operating Procedures.

SUPPORTING DOCUMENTS

ACOP's are documents that support health and safety in the workplace by offering an approved method of achieving compliance with regulatory requirements.

Approved COPs are provided for in Section 222 of the HSWA. Developed after consultation with industry experts, they contain statements of preferred work practice and recommend ways of complying with the requirements of the Act. Free internet copies are available from the WorkSafe website: https://worksafe.govt.nz.

ACOP is not a legally binding document like an act or regulation. It is not an offence to fail to comply with a COP. However, a COP is admissible in any civil or criminal proceedings as evidence of good/best practice. The courts may rely on the COP to determine what is reasonably practicable in the circumstances to which the COP relates.

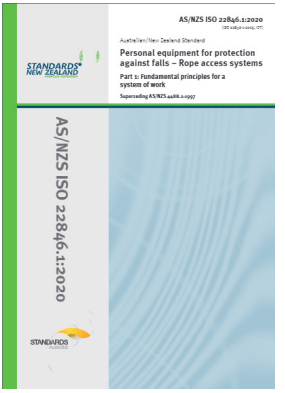
The most common Codes of practice that apply to Height work are:

- Safety and health in Arboriculture.
- Safety and Health in Forest Operations.

© IMPAC

STANDARDS (AS/NZS)

This joint Australian/ New Zealand standard is prepared by a Joint Technical Committee. The object of the standard is to specify requirements for the materials, design, manufacture, testing and marking of full-body, combination and lower body harnesses designed for working at height. There are 5 parts to the AS/NZS 1891 series (AS/NZS 1891.1 - AS/NZS 1891.5). There are also a number of other standards that apply to heights work that include:



- AS/NZS 4488.1 (Industrial rope access).
- AS/NZS ISO 22846 (Rope access systems).
- AS/NZS 5532 (Anchor manufacturing) .
- AS/NZS 2550.1 (Safe use of CRANES) .

Best / Good Practice Guidelines (Good Practice Guidelines)

The Best Practice Guidelines AKA Good Practice Guidelines for Working at Height in New Zealand provide health and safety guidance to all people working at height and those involved in the planning and preparatory stages of any project that includes work at height.

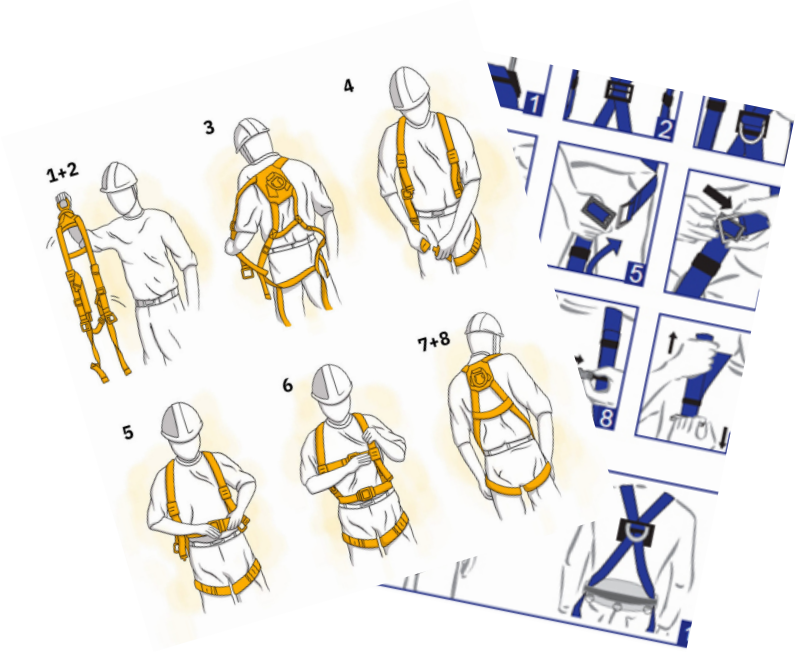
These are developed by WorkSafe NZ in consultation with industry subject matter experts and are published by the Ministry of Business, Innovation and Employment and have been prepared in association with industry representatives involved in working at height. The purpose of these guidelines is to provide practical guidance to employers, contractors, employees, and all others engaged in work associated with working at height on how they can meet their obligations.

© IMPAC

MANUFACTURERS' INSTRUCTION

The Manufacturer's instructions provide the user with information required to use the product safely. It states the purpose of the product or its intended use and any additional general and current relevant information about:

- How to use it safely.
- How to handle it (where applicable).
- How to store it.
- How to construct it (where applicable).
- How to inspect it for faults or prior to use (and duration intervals).
- How to clean it.
- Maintenance and repair information.



© IMPAC

LEGISLATIVE REQUIREMENTS SUMMARY TABLE

Legislative requirements connected to supporting documentation in terms of Fall arrest, Height Work, and associated activities for the terms listed on the left of the table below must meet the requirements listed on the right.

SUMMARY TABLE	
TERM	**REQUIREMENT**
Design	Fit for purpose, certified, meets the standards.
General Safety	Fit for purpose, correct height safety system used. Correct procedures, emergency plan, provide PPE, use correct PPE when working at height.
Permanently non-fixed access and platforms	Guard rails, regularly inspected and complies with building Act.
Temporary non-fixed access and platforms	Designed as per AS/NZS. Fit for purpose. Three points of contact used when climbing.
Safety Belts and Harnesses	Designed as per AS/NZS. Fit for purpose. Correctly fitted and six-monthly check and daily pre use check
Safety Nets	Conforms to B ENS 1263.1. Set up by a competent person.

© IMPAC

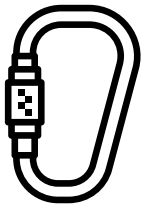
NOTES

© IMPAC

HARNESS SYSTEMS (HEIGHT SYSTEMS)

WHAT IS A HAZARD?

A hazard is an actual or potential cause or source of harm.



Harm may be caused to:

° People – death, serious harm.

° Environment – fire, pollution.

° Organisation – direct, indirect.

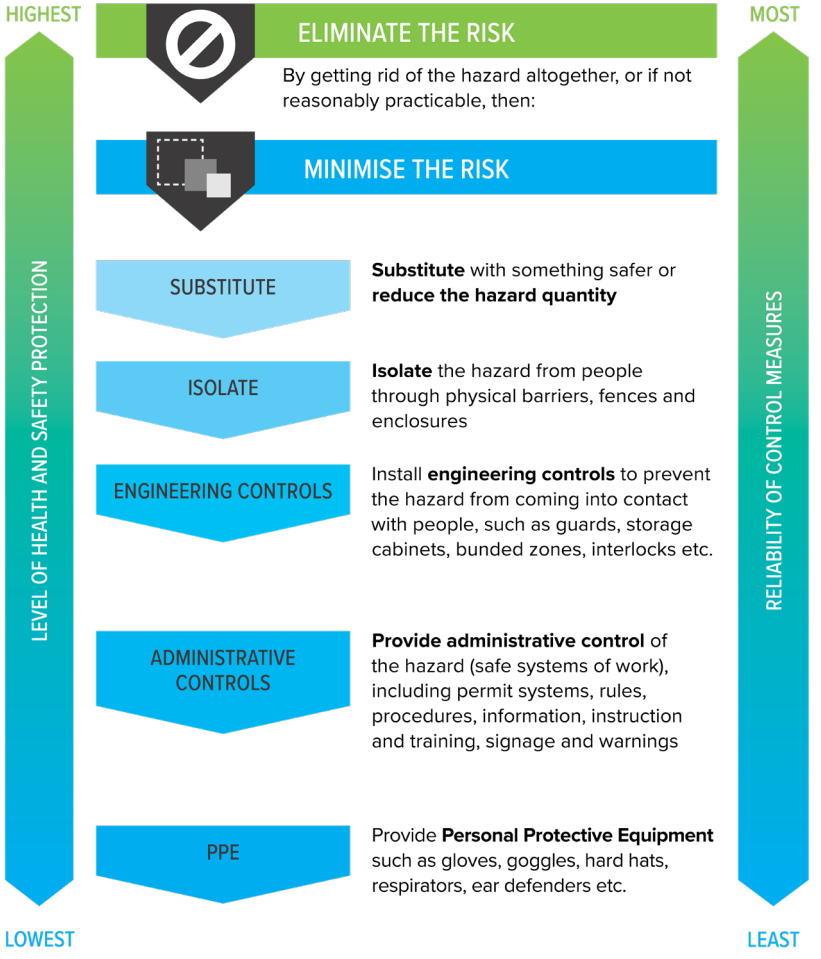
Common Hazards related to working at Heights:

- Falls from height
- Falling items
- Trips, slips and falls
- Weather (sun, rain, wind)
- Unguarded openings (guard rails)
- Ill-considered designs
- Untrained workers
- Other people
- Traffic
- Moving machinery
- Manual handling
- Lack of appropriate PPE

© IMPAC

HIERARCHY OF CONTROL:

Using the hierarchy of control measures to manage risk will help make sure the most effective control measure.



© IMPAC

HEIGHT SAFETY SYSTEMS (HARNESS SYSTEM)

A height system (harness system) enables a person to be positioned and safely supported at a work location for the duration of the task being undertaken at height. Harness systems are used for gaining access to, and working at, a workplace where there is a risk of a fall.

The most common harness systems include:

- Total restraint systems.
- Work positioning systems.
- Fall arrest systems.
- Industrial rope access systems.
- Safety lines, static lines, lifelines, prescribed or proprietary. (engineered) systems.

Hazards associated with wearing a safety harness and associated equipment.

A hazard is defined as anything that may cause injury or incident. The *potential* for harm is an important consideration. Harm is defined as **any form of physical or mental injury, which is why proactive risk management is essential.**

See below, for some examples of common hazard and controls. N.b. Every situation is different, and the risk should be assessed appropriately for each situation.

Height Work Hazard	Controls
Bad weather conditions during a roof inspection	Use correct PPE or stop the work until the weather conditions clears up
Unguarded openings/lack of guard rails on a residential multi-storey building	Use a MEWP. Install edge protection, use barriers or use a fall restraint method on the residential multi-storey building
Ill-considered height system design on a two-storey house build	Redesign the height system
No means of fall protection on a high-rise construction building	Use of scaffold, edge protection and barriers around the openings of the high-rise construction building

© IMPAC

Height Work Hazard	Controls
Inadequate anchorage points for a task at heights	Use a Certified MEWP with a shortened lanyard attached to dedicated anchor points on the basket.
Lack of knowledge and/ or experience for working at height	Provide supervision and training to workers who lack knowledge or experience
Lack of safety and protective clothing for the workers on a new 6 storey build	Obtain fit-for-purpose PPE

FALL RESTRAINT SYSTEM

Total/Fall restraint systems physically prevent the person from reaching a position at which there is a risk of a free or limited free fall.

Characteristics:

Controls a person's movement, by means of a connection to an anchorage in such a way that it will physically prevent the person from reaching any position at which there is a risk of a fall - either over an edge, through a surface or due to a failed moveable platform. Restraint techniques entail the use of a harness and adjustable lanyard or other components that can be adjusted for length by the user to maintain a restraint condition in different situations as the distance from the anchorage to a potential fall zone varies.

Advantages:

- Work positioning
- Not under complete influence of gravity
- Hands are free to complete the task

Disadvantages

- Limited Movement
- Can be challenging to locate anchor points
- May fall and slide down roof
- 12-15kN anchor point required.

© IMPAC

FALL RESTRAINT SYSTEM (CONT.)

Job Requirement: A recommended means of obtaining competence for workers who are involved in planning, installing, operating fall arrest systems and supervising staff is NZQA Unit Standard 15757 – "Use, install and disestablish proprietary fall arrest systems when working at height", or an equivalent or higher level of qualification. NZQA Unit Standard 23229 is a prerequisite for achieving NZQA Unit Standard 15757 as per the BPG for working at height in NZ. It is important that proper research is conducted before purchase of any height safety equipment to ensure that it is appropriate for the task.

A restraint technique may however, fail to prevent a fall in some or all of the following situations;

- The user inadvertently reaches a position where a fall over an edge is possible
- The user makes an error in adjusting the length on an adjustable lanyard such that a free fall position can be reached.
- There is a danger of the user falling through the surface (e.g., roofing material)
- There is support failure on a moveable platform leading to a fall.
- There are any other reasonably likely misuses or failures of the system that could lead to a free fall.

The requirement for fall arrested rated equipment and anchorages is designed to cover these eventualities. Restraint technique is suitable for use where the user can maintain footing without having to tension the lanyard.

Despite the requirement to equip the user for fall arrest, restraint technique should be employed whenever practicable as it is providing an extra level of safety by reducing the potential for exposure to falls.

In the great majority of temporary installations, systems thought to be total restraint do have residual fall risks and hence are, and should be treated, as a restraint technique rather than total restraint.

© IMPAC

Systems commonly mistaken as being total restraint are those that:

- Are mainly total restraint but have small areas that can be reached with the equipment being used and where a fall is possible.
- Require permitted people to use their own equipment thus providing a potential for an inappropriately long lanyard, whether fixed length or adjustable, to be used such that a fall becomes possible.
- Allow passage onto a surface where there is a risk of falling through the surface.
- May be designed to prevent a person falling out of a moveable platform but will not protect that person in the event of a platform failure.

WORK POSITIONING SYSTEM

Enable a person to work supported in a harness under tension in a way that a fall is prevented.

Characteristics: Supports the user in a work position whilst ensuring that the user is not under the full/total influence of gravity. Their harness and lanyard/pole strap/ fall arrest system will be under tension so that should they slip a fall is prevented.

Advantage:

- It is a hands-free operation.
- It supports the worker while performing their task.
- It enables its user to work in a stable position if performing a difficult or delicate task.

Disadvantage:

- It can take time to set up, depending on the system
- Movement can be restricted
- Can be difficult to find a suitable anchor point.

© IMPAC

WORK POSITIONING SYSTEM (CONT.)

Job Requirement: A recommended means of obtaining competence for workers who are involved in planning, installing, operating fall arrest systems and supervising staff is NZQA Unit Standard 15757 – "Use, install and disestablish proprietary fall arrest systems when working at height", or an equivalent or higher level of qualification. NZQA Unit Standard 23229 is a prerequisite for achieving NZQA Unit Standard 15757 as per the BPG for working at height in NZ. It is important that investigations be conducted before purchase of any fall- arrest equipment in order to identify the aspects of use that need to be catered for to enable the best system or equipment for the task to be selected.

The harness arrangement should not allow a fall of more than 600 mm. **Where a user at risk of a fall can maintain secure footing on a sloping surface without tensioning the lanyard or safety line, requiring additional support such as hand hold, fall arrest equipment attached to anchorages of commensurate strength shall be used.**

© IMPAC

WORK POSITIONING SYSTEM

Job Requirement: A recommended means of obtaining competence for workers who are involved in planning, installing, operating fall arrest systems and supervising staff is NZQA Unit Standard 15757 – "Use, install and disestablish proprietary fall arrest systems when working at height", or an equivalent or higher level of qualification. NZQA Unit Standard 23229 is a prerequisite for achieving NZQA Unit Standard 15757 as per the BPG for working at height in NZ. It is important that investigations be conducted before purchase of any fall- arrest equipment in order to identify the aspects of use that need to be catered for to enable the best system or equipment for the task to be selected.

The harness arrangement should not allow a fall of more than 600 mm. Where a user at risk of a fall can maintain secure footing on a sloping surface without tensioning the lanyard or safety line, requiring additional support such as hand hold, fall arrest equipment attached to anchorages of commensurate strength shall be used.

Factors that need to be considered as to whether secure footing can be maintained are as follows:

- The degree of slope. Slopes in excess of 15 degrees from the horizontal should always be checked for risk of a fall.
- Surfaces or skid resistance, change from dry to wet conditions and whether the surface is likely to be oily or otherwise slippery.
- Surface roughness likely to become a tripping hazard.
- Security when carrying heavy loads or operating handheld equipment.
- Unusual weather conditions, high winds, snow, ice, and frost.
- The grip provided by footwear, e.g., sole material and tread pattern.

© IMPAC

Where a user cannot maintain secure footing without the aid of lateral supports, an alternative means of access or support shall be provided, e.g., a harness and a pole strap, a walkway in accordance with AS1657 or a work positioning system such as a rope access system in accordance with AS/NZS 4488.2.

N.b. A fall arrest device shall not be used as a work positioning device, i.e., by locking it off to support a person in a position or location where there is a risk of free fall.

FALL ARREST SYSTEM

A fall arrest system is designed to support and hold a person in the event of a fall. It is not a work positioning system as they are not designed to support a person while working. Only when total restraint is impractical, should a fall arrest system be considered. Fall arrest is a minimisation measure as it does not prevent the fall from occurring. These systems require a higher level of operator competency and supervision.

Characteristics: A fall arrest system is an assembly of interconnected components consisting of a harness which is connected to an anchorage point or anchorage system directly or by means of a pole strap or lanyard incorporating an energy absorber or the use of an approved fall arrest device (FAD 2). They can be used where workers are required to carry out their work near an unprotected edge. When fall arrest systems are used an appropriate safety helmet shall be worn to protect the worker from head injury during an uncontrolled fall.

Advantages:

- ✚ Will stop a person hitting the ground – if set up correctly.
- ✚ Reduces impact force on the body to a maximum 6kN.
- ✚ Allows more freedom of movement.
- ✚ Worker can safely access an unprotected edge.

© IMPAC

Disadvantages:

- Can't support a person while working.
- Does not prevent the fall.
- Requires a higher level of user competency.
- Requires calculation of fall clearance (see below), which can be affected by human error.
- Impact force may still cause harm.
- May result in suspension trauma.
- May require emergency rescue.
- 15kN anchor point required.
- Fall clearance must be at least 6.55m (see below on how to calculate)

Job Requirement: A recommended means of obtaining competence for workers who are involved in planning, installing, operating fall arrest systems and supervising staff is NZQA Unit Standard 15757 – "Use, install and disestablish proprietary fall arrest systems when working at height", or an equivalent or higher level of qualification. NZQA Unit Standard 23229 is a prerequisite for achieving NZQA Unit Standard 15757 as per the BPG for working at height in NZ. It is important that proper research is conducted before purchase of any height safety equipment to ensure that it is appropriate for the task.

LIMITED FREE-FALL SYSTEM (A FALL LESS THAN 600MM)

Characteristics: A limited free fall system has the purpose of restricting the distance a person can fall to less than 600mm. It uses what as known as a FAD type 2 device. This device is generally attached to an anchorage point and pays out a line which is attached to the user's harness. The line is controlled by a spring-loaded reel which adjusts the line length as the wearer moves up and down in the course of the work. If the worker falls the reel locks by means of the inertia-reel or similar mechanical principle. It will activate when the load reaches a fall speed of around 1.5 metres per second or 250mm during a free-fall.

Advantages

- No trip hazard.
- Can self rescue.

© IMPAC

Disadvantages:

- Will still fall.
- Devices are limited to angles. (12kN required).

Job Requirement: A recommended means of obtaining competence for workers who are involved in planning, installing, operating fall arrest systems and supervising staff is NZQA Unit Standard 15757 – "Use, install and disestablish proprietary fall arrest systems when working at height", or an equivalent or higher level of qualification. NZQA Unit Standard 23229 is a prerequisite for achieving NZQA Unit Standard 15757 as per the BPG for working at height in NZ. It is important that proper research is conducted before purchase of any height safety equipment to ensure that it is appropriate for the task.

FREE-FALL (A FALL MORE THAN 600MM, BUT LESS THAN 2 METERS)

Characteristics: To arrest the fall of worker through the use of a shock absorbing pack, which restricts the forces on the worker to less than 6kN to avoid serious injury. The shock absorber must activate at a maximum force of 2kN (200kg). A shock absorber is normally constructed by loosely stitching together layers of webbing. As a force is applied, the stitching tears apart and absorbs some of the force. The energy / shock absorber must always be attached to the harness and not the anchor point.

Advantages

- Stops worker from hitting the ground
- Allows more freedom to move.

Disadvantages

- Impact force may cause harm
- Suspension trauma.
- 15 kN anchor point is required
- 6.55 m clearance is required.

Job Requirement: A recommended means of obtaining competence for workers who are involved in planning, installing, operating fall arrest systems and supervising staff is NZQA Unit Standard 15757 – "Use, install and disestablish proprietary fall arrest systems when working at height", or an equivalent or higher level of qualification.

© IMPAC

FREE-FALL (A FALL MORE THAN 600MM, BUT LESS THAN 2 METERS) (CONT.)

Job Requirement: NZQA Unit Standard 23229 is a prerequisite for achieving NZQA Unit Standard 15757 as per the BPG for working at height in NZ. It is important that proper research is conducted before purchase of any height safety equipment to ensure that it is appropriate for the task.

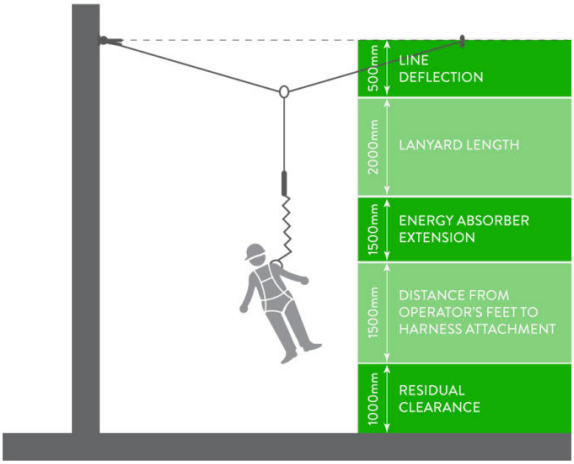
FALL CLEARANCE

Accurate fall clearance calculations prevent fallen workers from coming into contact with obstructions below, reduces the risk of serious injury, and may prevent fatal accidents.

It is also a critical factor in the selection of proper fall protection equipment.

The best location for an anchorage is directly above the position where you are working. The higher the anchorage, the less distance you will fall before your lanyard stops you. It's also important to keep your anchorage directly over you to prevent "pendulum" falls. In a swing fall, your body will not only fall downward, but also sideways until it is under the anchorage. The greater the sideways distance you travel, the more you will swing and possibly collide with objects around you.

Finally, check below your work area to make sure you will not strike anything before your fall protection devices stops you.



© IMPAC

SUSPENSION INTOLERANCE

Suspension intolerance (trauma) can cause what is known as orthostatic intolerance or in medical terms 'syncope' (fainting), which is a natural human reaction to being upright and immobile (suspended in a harness). During harness suspension, blood pools in the legs potentially leading to unconsciousness.

If the condition is allowed to develop unchecked, it can be fatal.

CONTROL FOR HARNESS SUSPENSION

An effective emergency response plan is necessary to ensure that (following an incident) the person can be removed from the suspended position as quickly as possible (ideally within 10 minutes).

Trauma/relief straps can also be used to assist in relieving pressure of the groin area after the fall is arrested through elevating legs to improve circulation.

© IMPAC

UNPROTECTED EDGE OR SIDES

Any edge or side (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no guardrail system or barrier preventing a person reaching or falling over an exposed edge.

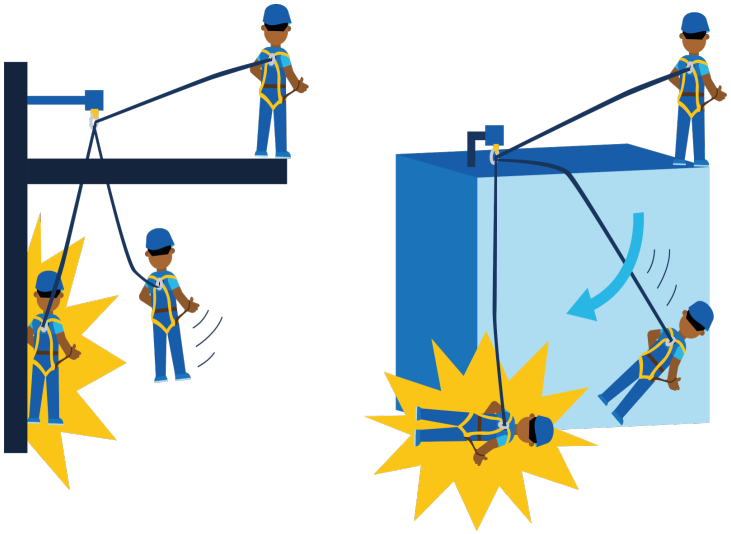
PENDULUM EFFECT

The pendulum effect is essentially a less than optimum working at heights positioning situation that may result in lateral movement or a 'swing' during a fall. According to the Best Practice Guidelines for Working at Heights, the pendulum effect is defined as a potential hazard with the use of a harness system. It can occur in two situations, swing down and swing back.

The pendulum effect is essentially a less than optimum working at heights positioning situation that may result in lateral movement or a 'swing' during a fall. According to the Best Practice Guidelines for Working at Heights, the pendulum effect is defined as a potential hazard with the use of a harness system. It can occur in two situations, swing down and swing back.

Swing down: Poorly placed anchor point and rope that is too long

Swing back: Poorly placed anchor that leads to swing back



© IMPAC

CONTROLS TO AVOID THE PENDULUM EFFECT

✚ Where possible a worker should remain opposite to the point of anchor; a mobile anchorage can be of assistance here.

✚ Attention to the positioning of single anchorages.

✚ Use secondary anchor points /diversion anchor points and/or anchor lines.

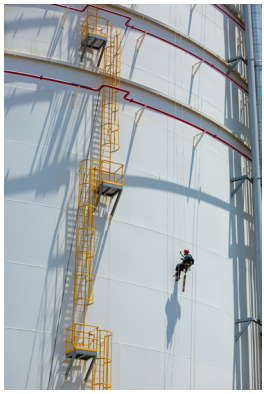
✚ Use a perimeter guardrail to prevent any fall over the perimeter (unprotected edge).

✚ Where the pendulum effect is possible, it is better to use a work positioning system, or another means of access such as a mobile elevating work platform (MEWP).

Factors that need initial consideration when choosing a Height Safety System include but not limited to:

A) Work Type:

✚ Pole work
✚ Work from a high fixed platform
✚ Ladder work
✚ Working conditions
✚ Distance to be negotiated for access and egress
✚ Confined space work
✚ Working on a slope
✚ Work requiring horizontal restraint only
✚ Work from elevating work platforms, building maintenance units and suspended scaffolding.



B) Potential for a fall and fall severity e.g.-

✚ Free fall, including restraint technique that could result in a free fall
✚ Limited Free fall, including restraint technique that could result in a limited free fall
✚ Restrained fall

C) Task Mobility requirements, e.g. degree of lateral and vertical movement needed to perform the task whilst connected to the system.

D) Constraints on fall distances and clearances.

© IMPAC

The work plan should include a risk assessment of any special hazards which includes but is not limited to:

A) Work in adverse environments (Specialist equipment might be required)

- Natural hazards, including wet weather, wet or icy surfaces, sand, dust, and high winds.
- Chemical hazards (Hazardous Substances)
- Heat hazards, including hot surfaces, sparks, and naked flame.
- Mechanical hazards, including power cutting tools and sharp edges.
- Free flowing solids such as grain in silos.

B) Work Task Hazards

- Welding.
- Using power tools.
- Use of abrasives.
- Use of chemicals likely to have an adverse effect on the equipment.
- Electrical work.
- Work in explosive or flammable atmospheres.
- Work in confined space.

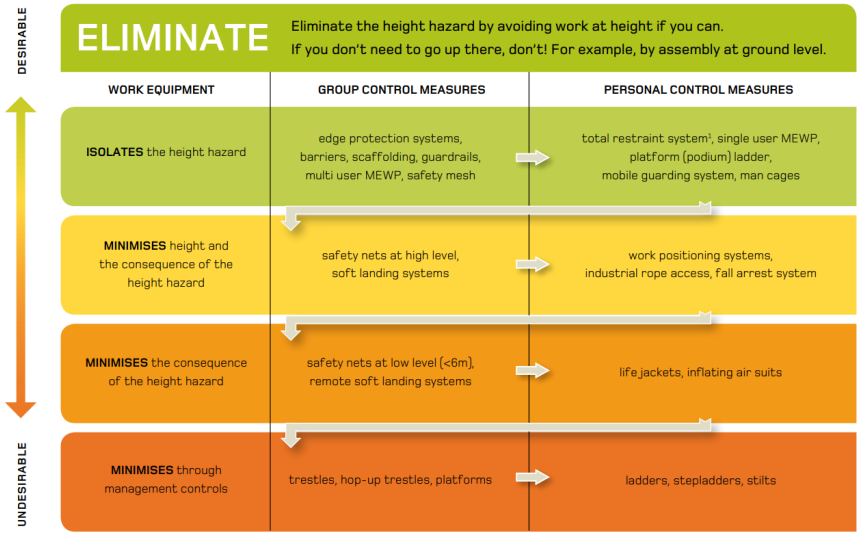
Where one or more of these tasks is likely to be encountered, consideration should be given to the following:

- The adoption of altered work practices such as two separate lanyards.
- The provision of protective sleeves or covers.
- The purchase of special equipment designed to cope with these hazards.

© IMPAC

CHARACTERISTICS OF VARIOUS RESTRAINT/FALL SITUATIONS			
RESTRAINT / FALL SITUATION	**SYSTEM DESCRIPTION**	**EQUIPMENT AND ANCHORAGE REQUIREMENTS (MINIMUM)**	**TYPICAL APPLICATION**
TOTAL RESTRAINT	**A system where no fall is possible**	Not specified in the AS/NZS 1891 series. Whilst no equipment is specified, fall-arrest rated equipment can be used.	Total restraint systems are usually found as permanent installations on completed buildings or structures
RESTRAINT TECHNIQUE	A combination of anchorage placement and lanyard length adjustment which will not physically permit the operator to reach a fall-risk position unless the lanyard is incorrectly adjusted.	Fall-arrest rated equipment as follows: Where any possible fall will only be a limited free fall(<600mm), a lower-body harness and anchorage with ultimate strength 12kN. All other cases, a full-body harness and anchorage with ultimate strength 15kN	Any situation where access to the work can be achieved entirely on a working surface with secure footing and without exposure to a fall provided that the equipment is correctly adjusted.
RESTRAINT FALL ONLY	A pole-strap of length which will permit only a restrained fall when working on a pole.	Full-body or lower-body harness and pole strap	Working on a pole where no free fall is possible
LIMITED FREE FALL	A combination of anchorage placement and lanyard length which will permit only a limited free fall (<600mm)	Full-body or lower body harness. Lanyard or fall-arrest device that will limit free fall to 600 mm max	Any situation where the use of either a short lanyard or a fall-arrest device (or both where applicable) will limit any free fall to 600mm. May also be applicable to rope access systems AS/NZS 4488.2
FREE FALL	Any suitable fall-arrest system.	Full body harness. Lanyard or fall-arrest device which will limit free fall to 2m max, 15kN ultimate strength anchorage or equivalent horizontal lifeline or rail.	Any situation in which a free fall greater than 600mm is possible.

© IMPAC



This provides assistance for selecting the best equipment for keeping people safe at height. This figure steps through a comprehensive range of possible controls, starting with the most effective – elimination, and then working through isolation and minimisation.

Figure 2: The selection of work equipment linked to hierarchy of controls

While a harness is classified as PPE, which is a minimisation control, a total restraint system is more desirable than other minimisation controls and can be considered isolation of the hazard.

© IMPAC

INDUSTRIAL ROPE ACCESS SYSTEM

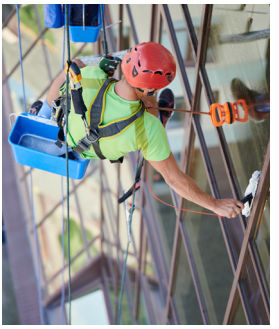
Industrial rope access is a highly specialised work method. Rope access uses techniques originally developed in caving and climbing to allow workers access to difficult-to-reach locations. Rope access techniques are successfully used around the world, and in New Zealand the industry is growing quickly. Commonly employs a working line and a safety line. The working line, on which the operator is suspended under tension during ascent and descent, is the primary means of access. Depending on the mass of the operator, the anchor is subject to a continual force of 1-2kN, which should be applied in a static manner. This is also known as a work positioning system. The safety line plays no part in the access system but is always available to catch the operator in the event of a mishap with the working line or the operator's attachment to it. The anchor for the safety line can then be subject to a force of up to 6kN. This is also known as a limited free fall system. Forces generated in falls of less than 600mm are held to be less than 6kN.

TYPES OF ROPE ACCESS INCLUDES:

Geotechnical: The geotechnical field is very diverse in New Zealand and provides methods for work outdoors that concentrate on establishment, stabilisation and remedial activities on roads, bridges, mining and developmental activities. High levels of experience and supervision are needed to ensure that safe working methods are maintained.

© IMPAC

Urban: Urban rope access is a large and varied field with applications and methods dealing with man-made structures. Types of work range from window cleaning and painting to general maintenance, glazing, construction, and restoration work. Also included are types of difficult access for roofing, repairs, and access to and from work on telecommunications installations. Rope access systems which rely on basic techniques such as window cleaning and painting still require appropriate levels of experience and supervision.



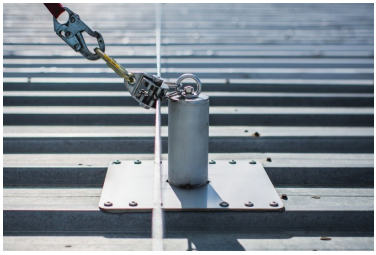
Film and Theatre: Rope access systems are becoming more common in film and theatre applications, including stunt work and rigging for stages. All operators who are required to work aloft should have formal training in work at height situations and rope access methods where appropriate. Situations involving flying other persons aloft who are not necessarily trained or experienced (acting talent) should be controlled by advanced operators with suitable experience and supervision skills.

Oil and Gas: The oil and gas industry have a number of tasks for which rope access personnel are regularly engaged. This can vary from installation and maintenance procedures to the safety supervision of others. Additional requirements may be needed for off-shore work, including formal qualifications, fire-fighting and other emergency procedures. Gaseous atmospheres and other toxic hydrocarbon environments may require additional safety management regarding equipment selection, such as resistance to chemicals and mixtures of steel and aluminium alloys creating low thermal sparks.

© IMPAC

SAFETY LINES, PRESCRIBED OR PROPRIETARY (ENGINEERED) SYSTEMS

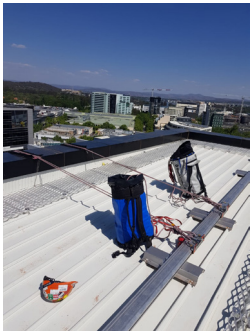
Horizontal Lifelines: Horizontal lifelines function differently to single anchor points as the end anchors on the lifeline are subjected to magnified shock loads in the event of a fall. These forms of anchorage are used when users need to be able to move laterally over significant distance whilst connected to the system.



Horizontal Lifelines

Horizontal lifelines and rails are essential linear anchorages which allow users of fall arrest equipment the flexibility of lateral movement, without having to disconnect from the anchorage. All horizontal and vertical lifelines should be tagged and re-certified annually to remain compliant with AS/NZS 1891.4:2009.

Rigid systems: Generally comprise a steel or other metallic structural member along which one or more mobile attachment device run, each providing a travelling anchorage for connection of a personal lanyard or fall arrest device.



Rigid System

Static lines: are fixed ropes or cables that help workers move a significant distance without having to detach from the line. When used as an anchor, the static line operates much like a harness system with the slack in the line providing shock absorption. It can be fixed horizontally between two supports and is designed for use during fall arrest situations where users need to move over large areas but do not want any attached parts getting in their way, however users are restricted to a parallel straight line.

Static Line

© IMPAC

Flexible lines (Proprietary system): Such systems are known as ‘engineered’ systems. They comprise flexible lines with end anchorages and usually intermediate anchorages along with mobile attachment devices which may be capable of passing across intermediate anchorages without disconnecting from the line and to which personal fall arrest equipment may be connected. The systems are usually provided either in kit form with rigging instructions for the various configurations they have been designed for, or as a completed installation by or under the control of the supplier.

Flexible lines (Prescribed configurations): These systems are configurations prescribed and tabulated in AS/NZS 1891.2 Supplement 1. They offer an alternative to a propriety system but rely for their safe operations on strict observance of the requirements of AS/NZS 1891.2 Supplement 1. They comprise flexible lines with end and intermediate anchorages, as do propriety systems, but rely on conventional attachment hardware such as snaphooks and karabiners for connection of personal fall arrest equipment to the line. These devices are not capable of passing across intermediate anchorage without disconnection.

© IMPAC

NOTES

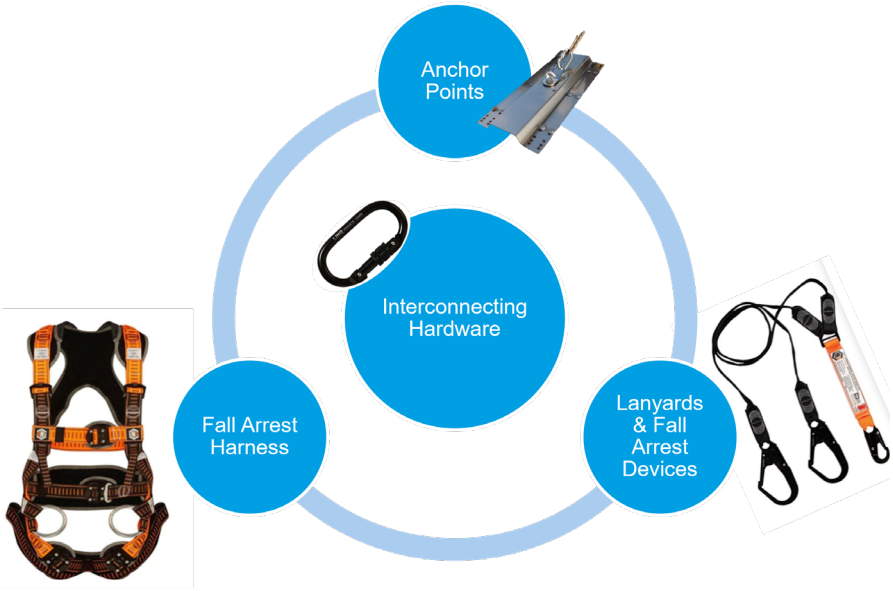
© IMPAC

HEIGHT EQUIPMENT AND INSPECTIONS

ANCHOR POINTS

An anchor point is a secure point of attachment to a structure to which a fall arrest device or anchorage line may be attached and will have a rated loading. Selection of the type and location of anchorages will depend on the nature and location of the task and the type of construction of the building or supporting structure.

Anchor points should ideally be positioned above head height of the worker to limit the fall distance.



© IMPAC

PERMANENT ANCHOR POINTS

A permanent anchor point should be designed by a chartered professional engineer. The manufacturer and designer should ensure that each permanent anchor is uniquely identified so that its installation, testing, and maintenance can be tracked during its lifetime. Signs shall be provided for each anchorage point with the following information:

- Name of the installer and installation date.
- The highest purpose category for which the anchorage is suitable.
- The ultimate strength rating if less than 15kN.
- The maximum number of people (not more than two) who are permitted to be connected to the anchorage at one time.

The building or structure and anchorage points shall be assessed by an engineer, unless it is clear to a height safety supervisor that the anchorage system is structurally adequate. An example of where an engineer may not be required is where an anchorage sling of adequate strength is secured around a solid permanent structure such as a plant room. If doubt exists, an engineer shall make the assessment. It shall be certified by an engineer and proof tested annually. Installation and proof testing should be in a site register. The anchorage and the structure to which it is attached shall be capable of sustaining an ultimate load equal to what is shown in the table below for the corresponding anchorage purpose for single person use when loaded in the direction of the lanyard, anchorage line, or restraint line during a fall arrest. This load requirement shall be increased by 6kN (i.e., to 21kN) if two people are to use the one point. N.b. The maximum number of people connected to any one point shall be two.

Signs in accordance with AS/NZS 1891.4 shall be provided for each anchorage point which will be in place for a period longer than one month. The sign shall show the following information:

a) Name of the installer and installation date, or if an existing structure has been certified the name of the certifier and the certification date. N.b. Permanent Anchors must be recertified once a year.

b) The highest purpose category for which the anchorage is suitable. (Free Fall/ Limited free Fall/ Restraint Technique)

© IMPAC

c) The ultimate strength rating if less than 15kN. In this case words to the effect that the anchorage is not to be used for fall- arrest shall be added to the sign.

d) The maximum number of people (not more than two) who are permitted to be connected to the anchorage at one time.

At permanent installations the information shall be shown either on a sign located at each anchorage point or alternatively, on a plan prominently displayed at the entry to the area.

Purpose of Anchorage	Ultimate strength in direction of loading
(a) Single point anchorages	
Free Fall-Arrest - One Person	15 Kn
Free Fall Arrest - Two persons attached to the same anchor	21 kN
Limited Free-fall (including rope access anchorages)	12 kN
Restraint Technique	12 kN (risk of limited free fall) or 15 kN (risk of free fall)
(b) Horizontal Lifelines	
- End Anchorage	Minimum of 15 kN for one person or 21 kN for two persons or as per manufacturers instructions for single point anchorages.
Intermediate Anchorage	
- Diversion less than 15	12 kN
- Diversion 15 or more	12 kN + (apply a safety factor of 2.0)

© IMPAC

TEMPORARY ANCHOR POINTS

A temporary anchor can include proprietary (all inclusive) fittings or an appropriate arrangement of strops, slings and ropes. All temporary anchors shall be set up by a competent person. Where a proprietary temporary system is used, it shall be installed in accordance with the manufacturers or designer's instructions and specifications. The roof or other building component to which an anchor is to be attached shall be checked by a competent person to verify that it is suitable for supporting the anchor. Certification is not required unless installation is longer than one month. It shall be removed as soon as it is no longer required due to wear or exposure. Using temporary anchor points must be done with utmost caution. Always attach to a substantial structure using a strop or appropriate rope line.

An RSJ (I-beam) or similar is an example of a substantial structure.

© IMPAC

Anchor Point	Type of Work Used for	Strengths	Limitations	Certified / Non-certified	Pendulum Effect
	Roof inspection and regular maintenance.	• Peace of mind. • Guaranteed Rating. • Installed by competent user.	• Must be Installed by a professional engineer. • Is limited to poistion of installation.	Yes	Yes
	Roof work, satellite repair, scaffolding	• Can be moved to other positions. • Do not require a professional engineer.	• Must be Installed by a competent person. • Is only an estimated rating.	No	Yes
	Arborist work, Rope access work.	Can be moved to other positions. Do not require a professional engineer.	• Must be Installed by a competent person. • Is only an estimated rating.	No	Yes

SLINGS (IMPROVISED ANCHOR POINT ATTACHMENT)

An anchorage sling is a sling that has been designed to be placed around a structural element to form an anchorage. A sling should not be chocked pulled unless it has been designed for this manner of rigging. A chocked sling has a reduced load capacity.

The angle between the sling legs should not exceed 120° (This is a third of the inside of a circle)

Characteristics: Slings have round end webbing and open round ends and come in different sizes. They can be used to create temporary anchor points by circling over satisfactory structures such as RSJ (I beam).

Advantages

- Lightweight and easy to carry.
- Inexpensive.
- 21kN rating.
- Lightweight.
- Can be used multiple times.

Disadvantages

- Choking brings down the strength shrinkage.
- Sharp edges can damage the webbing.
- Knotting the sling significantly reduces the strength.

Height Work Suitable For:

Slings can be used in all height work and incorporated in all the height systems.

Things to check before use:

- kN Rating.
- Condition (visual inspection).
- Cuts or damage to webbing.
- Damage to eyes.
- Damage to nylon/metal fittings.
- Chemical damage.

© IMPAC

LANYARDS & FALL ARREST DEVICES

A lanyard (shock absorbing lanyard) is a line used to connect a fall arrest harness to an anchorage point or static line in situations where there is risk of a fall.

Type of Work

They are commonly used in construction work or in working at height situations where total restraint or work position systems are not possible.

The line can be constructed of polyester rope, webbing or chain and includes an integral shock absorber system.

A lanyard should:

Be fitted with a shock absorber to reduce force on the body.

- Be attached to the harness with the shock absorber end.
- Be inspected before use

A lanyard must be capable of withstanding a static load of 15kN (1500kg) without breaking. All hooks, karabiners and hardware must be capable of withstanding the same load without distortion.

SHOCK ABSORBERS

Shock absorbers are one of the most essential parts of any height safety system. They work by reducing the impact of the fall and the resulting forces on the body at the bottom of the fall arrest. Shock absorbers are designed to reduce the force on the body to no more than 6kN (600 kg).

The absorber must activate at a maximum force of 2kN (200kg). A shock absorber is normally constructed by loosely stitching together layers of webbing. As a force is applied, the stitching tears apart and absorbs some of the force. The energy / shock absorber must always be attached to the harness and not the anchor point.

Advantages of a Lanyard

When connected to the correct harness and anchor point, the lanyard serves two main purposes:

- They restrict the fall to the maximum designed length of less than two metres.
- They are designed to reduce impact force on the body to a maximum of 6kN (600kg).

© IMPAC

Disadvantages of a Lanyard:

- They can be prone to operator error.
- If not regularly inspected (every 6 months), they maybe out of date.

The maximum working length of a lanyard must be two metres or less. Once a lanyard has been subjected to a fall, it must be removed from service.

The lanyard is attached to an anchor point by using a karabiner or double-action snap-lock hook or anchor-connecting device, e.g. Omni-grip. Never wrap a lanyard around a pipe or beam and connect a snap-lock hook back to the lanyard. Only use a strop/sling in this situation.

The shock absorber end of the lanyard should ideally be connected to the rear (dorsal) D-ring of a harness.

TYPES OF LANYARDS

Fixed Length Lanyards:

Characteristics: A single line of fixed length, fitted with a connector at each end and a shock pack to reduce the impact of a fall. A fixed lanyard is used in a potential free-fall situation. The length of the lanyard is two meters as per AS/NZS1891.4. The lanyard is attached between an anchor point and harness to arrest a user in a fall.

In most practical situations the anchor point needs to be at or above the level of the attachment point on the harness. If below the attachment point, there could be difficulty in obtaining enough working slack in the lanyard if the maximum free fall of 2.0 m is not to be exceeded. In each case a check on the fall distance is required to ensure that the maximum of 2.0 m is not exceeded.

Advantage:

- A one-piece device with easy handling.
- It has a shock absorber which will reduce the impact of a fall.
- A worker using the lanyard can be constantly attached to an anchor point.

© IMPAC

Disadvantage:

- Cannot move around an object whilst staying connected.
- A worker could still fall whilst using this lanyard.
- A worker could still hit the ground after the fall if the fall distance was not correctly calculated or the length of the lanyard wasn't adjusted accordingly.

Double/Twin tailed Lanyards:

Characteristics: A Lanyard having two tails of which separately meets the requirements of a single line lanyard. Both lanyards join onto a common shock, or energy absorber.

Height Work Suitable For: Examples of this could be when moving around scaffolding. It is also appropriate for use when transferring between attachments so that the user is always connected to an anchorage via one or other of the tails. Another use would be passing intermediate anchorage when moving along a horizontal lifeline/ static line.

It is recommended that when using a twin tail lanyard whilst moving, one tail is connected to the anchor point and the spare tail is connected to a manufacturer-approved lanyard stowage point. N.b. Do not connect the spare tail to front or side D-rings, as serious injury may occur in the event of a fall.

When in working positioning situations, both lanyards can be connected to the anchor. **N.b. Do not exceed an angle of 120 degrees between the two tails, the tails may tear away from the lanyard, leading to a serious injury or death from the resulting fall.**

Advantages

- Able to move around obstructions while remaining connected at all times when transferring between anchor points.
- Ability to extend work area.

Disadvantages

- Additional weight in materials (two snap/scaff hooks).
- Possibility of user error when calculating the fall distance.
- Susceptible to user error because there are two tails.

© IMPAC

Adjustable Lanyards

Characteristics: A lanyard incorporating a length adjusting device. It is designed so that no component can be separated from the assembly without causing damage that would render the lanyard unusable. It is appropriate where the adjustable feature is needed for a variety of different use situations and the risk of misuse is manageable

Advantage:

- Length of the lanyard can be adjusted.
- It has a shock absorber which will reduce the impact of a fall.
- A worker using the lanyard can be constantly attached to an anchor point.

Disadvantage:

- Cannot move around an object whilst staying connected.
- A worker could still fall whilst using this lanyard.
- A worker could still hit the ground after the fall if the fall distance was not correctly calculated or the length of the lanyard wasn't adjusted accordingly.

© IMPAC

TYPES OF LANYARDS (CONT.)

Fall arrest devices shall conform to AS/NZS 1891.3 They are categorised and used as follows:

Fall Arrest Devices, FAD Type 1 (Includes rope and rail grab)

Characteristic:

The type 1 device is attached to a fixed vertical or substantially vertical rail or a fixed flexible line and can move up and down the rail or line at a predetermined maximum rate to follow the movement of the user. The user is connected via a short lanyard to the activating lever which locks the device in the event of a fall. It's a device that travels along an anchorage line, which locks to the line when a load (such as a falling person) is applied. The device can only be loaded in the direction of the line.

Advantages:

- Can be used in both work positioning and total restraint systems.
- Can be used with different types of harness.
- Relatively easy to use.

Disadvantages:

- Possibility of a pendulum effect if the device is set up incorrectly.
- Cannot connect with other height safety systems while in use.

Fall Arrest Device Type 2 (Inertia reel / self-retracting lifeline)

Characteristics: This device is generally attached to an anchorage point and pays out a line which is attached to the user's harness. The line is controlled by a spring-loaded reel which adjusts the line length as the wearer moves up and down in the course of the work. Under fall-arrest conditions the reel locks by means of the inertia-reel or similar mechanical principle. It will activate when the load reaches a fall speed of around 1.5 metres per second or 250mm during a free-fall.

The retractable line may be constructed of steel cable or a web strap. The line automatically retracts into the housing when not under load, which reduces the risk of it becoming entangled.

© IMPAC

Type 2 FADs are usually attached above the wearer in a vertical operating position. The effects of pendulum motion must be taken into account when assessing the most appropriate type of fall-arrest device to be used. Tie-off adaptors may be used to prevent excessive pendulum motion.

Advantage:

- Self-rescue is possible (due to short fall).
- It is compact and minimises tripping hazards.
- Reduces fall distance.

Disadvantage:

- Possibility of a pendulum effect if the device is set up incorrectly.
- Limited to working angles as per Manufacturer.
- Cannot be used for work positioning.

Fall Arrest Device Type 3

Same characteristics as the type two with the addition of a winching mechanism. Types 2 and 3 FADs should be inspected by a competent person once a year and any time the locking device has been activated as the result of a fall. As with any item of fall arrest equipment FADs should, in addition to the mandatory annual inspection, be checked prior to use by the user. Often used in conjunction with a tripod. i.e. confined space entry.

Advantage:

- Can be rescued from above.
- Self-rescue is possible (due to short fall).
- Reduces fall distance.

Disadvantage:

- Possibility of a pendulum effect if the device is set up incorrectly.
- Limited to working angles as per Manufacturer.
- Cannot be used for work positioning.

© IMPAC

Three checks that should always be conducted prior to use are:

- Check the unit has a current inspection record less than 12 months old
- Pull down sharply on the line to ensure locking occurs.
- Pay out the line (steel wire or web strap) fully to ensure it is attached to the device and to check for any obvious signs of damage to the line.

SAFETY NETS (TYPE S FAD: SECONDARY FALL PROTECTION SYSTEM)

Characteristics: Safety nets are usually installed at construction sites of multi-level buildings and similar works mainly to arrest a person's fall, although they can also be used to catch or contain debris.

Safety nets are manufactured from synthetic materials. It is essential that safety nets are subject to regular examinations by a competent person and are periodically tested in accordance with the manufacturer's instructions. The manufacturer's instructions shall also be followed for installation, use and storage.

Example of height work:

- Construction.
- High-level work areas.
- Roof Installations.

Ways that a safety net will reduce the level of risk when working at height:

- Provide group (collective) protection as they not only protect the person working at height.
- Provide a secondary means of protection to those below, from falling items.

Advantage:

- Act as a secondary means of fall protection.
- Safety nets can act as satisfactory means of collective fall protection protecting a large number of workers in the event of a fall, while still also allowing maximum flexibility in the work area.
- They are lightweight and rot-resistant.
- They can catch tools and can contain light debris from falling on the street below.

Disadvantage:

- They must be installed by a certified person.
- They can be easily damaged by improper use, wear and tear, heat or flame, handling, or storage.
- They can also be adversely affected by weathering, UV degradation and environmental factors resulting in some strength loss.
- Small tools and debris can still slip through the net.

Installation of Safety Nets

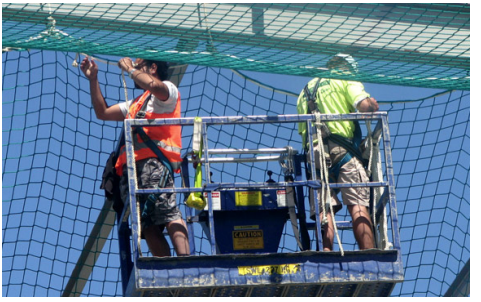
Safety nets must be rigged by a competent person who can demonstrate specialised training in this field. Depending upon construction, it may be necessary to add additional netting to provide perimeter protection.

- Nets must be tied off (secured) every two metres (minimum).
- Nets are to be inspected daily.
- Nets are to be stored in a dry, shaded area with good ventilation.
- Nets need to be protected from combustible materials, chemicals, welding slag etc.

Classification of safety nets

Safety nets conforming to BS EN 1263-1 should be used. For further guidance see:

- EN 1263:1 (2002) Industry Safety Nets.
- BS EN 1263:2 Safety Requirements for the Positioning Limits.
- BS 3913: Industrial safety nets.



© IMPAC

STATIC LINES:

Characteristics: Static lines comprise a cable or rope system incorporating shock absorption that is fixed horizontally between two anchor supports. The static line is designed to function as a fall arrest anchor system. Static lines are used to enable freedom of movement over a large area, albeit in a straight line. It is preferable that the user should be able to transverse the line without the need to detach themselves. If not then a two tail lanyard will be required.

The cable used is normally 10-16mm dependent on the number of users and must have a minimum breaking strain of 44kN (refer to AS/NZS 1891.4). The end anchor points must each be capable of withstanding a 22kN (minimum) static load.

The installation criterion is the same for both permanent and flexible systems. Static line installation is classed as Basic Scaffolding. The NZ Health and Safety Regulations require that persons who erect static lines and fall arrest systems at a height of five metres or greater must hold a certificate of competency.

Extreme care must be taken when using portable or temporary lines and installation should consider the following criteria:

- Expanse of cable.
- Stretch factor on cable.
- Number of users.
- Location of anchor points.
- Capacity of anchor points.
- Height of cable.
- Need for shock absorption.
- Need for intermediate supports.
- Tension device for cable.
- Type of traveller to be used.
- Location of objects below line.
- Access to static line.

© IMPAC

Static lines are suitable for the following types of height work:

- Working along an exposed (unprotected) edge.
- Having to move in a horizontal work position.

Advantage:

- Can have an expansive (length) of line.
- Can have multiple uses at once.
- Can be linked through intermediate supports.

Disadvantage:

- Possibility of a pendulum effect if the device is set up incorrectly
- Limited to height it is set up at.
- Getting access to static line for connection can be a challenge
- Can require a twin tail lanyard if the line is linked between supports.

Ladder Fall-Arrest Systems

These can be temporary, using a polyester rope, or permanent, using a flexible steel cable or an integral track or rigid rail system.

Under the standards, a rope system cannot be used for more than three months in an open environment due to possible degradation of the rope. The rope is classified as an anchor line and must comply with the minimum installation requirements as previously detailed. Rope thickness should be 12–16mm.

The traveller must be attached in the correct travelling and locking direction. An opening device is fitted to certain models, which allows for removal of the traveller from the rope. In some instances, there may be a short (300mm maximum) lanyard attached to the traveller.

The traveller must be attached to the rear dorsal or frontal attachment point on the harness. Connection to a side attachment point will cause the faller to be tipped sideways, resulting in damaging loads on the body and the equipment. Attachment to the traveller should be by way of a rated karabiner.

© IMPAC

Permanent Ladder Installations

The steel cable is normally a 19/1 type 8–12mm diameter and is connected to either the ladder rungs or the top structure. The anchorage must be capable of supporting a minimum 15kN load.

A shock absorber is incorporated in the top anchor system and the cable tensioned to the bottom support bracket. These systems must be inspected and maintained on an annual basis.

Integral Track/Rigid Rail Systems

Integral track or rigid rail systems can be used in both vertical and horizontal applications. They are versatile in terms of angles, corners and slopes. As with the rope of wire system, a traveller locks to the rail in the event of a fall. The track/rail is normally constructed from aluminium with the traveller incorporating a bearing mechanism.

The standard requires the rail structure, all components and hardware to be capable of withstanding a static load of 15kN. These systems are often incorporated into high-rise applications for use by window cleaners and maintenance staff.

HARNESSES

Designed for attachment to a lanyard or fall-arrest device. They should be used wherever there is a likelihood of a free-fall. When working at height, it is important to select the correct type of harness for the work to be carried out. There is a selection of harness that are designed specifically for the types of work to be undertaken when working at height. Refer to your hazard ID/JSA to work out whether the harness you have is suitable for the height safety work you are undertaking.

NOTE: All types of harnesses can be used for total restraint.

Full Body Harness

A full-body harness is an assembly of interconnected shoulder and leg straps, which may incorporate a waist or other horizontal straps designed to increase the weight bearing area on the body and to prevent the wearer falling out of the harness during a fall. They are also known as a fall-arrest harness.

In regard to height systems, they can be used with Restraint, Limited Free fall and Free fall situations.

It is not capable of being separated into two more elements without damage which will render all parts unusable.

✚ In a free-fall situation, it is strongly recommended that we attach to the rear dorsal D-ring attachment point.

Example of Work: Any height related work. Examples include but are not limited to:

✚ Access edge of roof for gutter maintenance.

✚ Construction work.

✚ Scaffolding.

✚ MEWP Operations.

Recommended height system: A full-body harness shall be used in any situation where a free fall of more than 600 mm is possible.

© IMPAC

Advantage:

- Allows for hands-free operations.
- Stops you from hitting the ground if used correctly.
- Can be used for work positioning.

Disadvantage:

- Higher risk of entanglement than other types of harness.
- Can be uncomfortable to wear.
- 10 year life span.
- Risk of harness suspension (Suspension intolerance).

Attachment points are provided on full body harnesses as follows:

- At least one centre front attachment point (Chest/waist or both).
- A rear attachment point at the dorsal (Never at the waist level).
- Side attachment points at waist level may be provided exclusively for use in pairs for attachment of a pole strap. For this purpose, the harness needs to be the waist strap type.
- A harness that is to be used for access and possible rescue or retrieval through narrow confined spaces, is to have confined space retrieval attachment points as follows:

  o Retrieval attachment points fitted to the shoulder straps of the harness in a manner that will retain the wearer in a head up position when being lifted.

  o Wrist straps attached to the spreader bar that enable the wearer's arms to be raised above the head to facilitate rescue.

N.b Both Shoulder and side attachment points should not be used for arresting a fall.

© IMPAC

Lower Body Harness (Sit Harness)

A lower body harness is made up from an assembly of an adjustable waist strap connected to a pair of leg loops by means of front straps, and other straps such as a sitting strap which passes under the pelvis so as to support the lower part of the body in a sitting position. It does not have shoulder straps.

In regard to height systems lower body harnesses should only be used in limited free fall and/or restrained fall (total restraint), and work positioning scenarios. The lower body harness should be used in conjunction with a pole strap (see below) where a restrained fall is possible and a short lanyard (up to 300mm) or connector where a limited free fall is possible.

Types of work include: both ladder and pole work and are also commonly used in arboriculture and roof work. The lower body harness may be used with a longer lanyard when used in restraint technique, provided a fall greater than 600mm is not possible.

Selection of a suitable lower body harness should take into account the following factors:

- Ease of rescue.
- Ease of putting on and taking off.
- Wearer comfort during normal work including if suspended for any reason.
- Ability to adjust components to fit the various body shapes likely to use it.
- Ability to spread the load of a fall arrest on the wearer's body and provide a measure of comfort whilst the wearer is suspended after a fall.

In addition, the requirement to constantly support the wearer's weight in a work positioning situation will need to be taken into account when considering fit and comfort. People with certain body shapes may tend to slip out of a lower body harness if inverted. If this is likely to happen, a full body harness should be used.

Attachment points on the lower body harnesses are provided:

- At centre front waist level for use with a short lanyard for limited free fall or for connection when using restraint technique.
- On each side at waist level when required for exclusive use with a pole strap.

© IMPAC

Safety Belt (Work Positioning Belt)

Work positioning belts are a light weight workpositioning belt that can only be used when there is no risk of a fall. They have two buckles on each side of the waste, which allows workers to clip into either a restraint system or a polestrap.

In regard to height systems, they can be used in work positioning when used with a pole strap or as a restraint when a worker is working near an unprotected edge. **N.b. They do not provide fall protection on their own.**

✚ They are commonly used as restraint belts, which means that the belt is worn by a person who is working close to a potential fall. In this instance the person using the belt must set up a height safety system that makes it impossible for them to reach an unprotected edge where they could fall. This can be done using a restraint belt and an adjustable restraint lanyard. This is working with restraint rather than fall arrest and therefore because the restraint system makes it impossible for them to reach the fall zone shock absorbing fall arrest equipment is not required.

N.b. Restraint lanyards must never be used in a fall arrest situation.

✚ The most common type of work include both pole work and arboriculture.

Lineman's harness (Linesman Belt)

The Linemans harness' design is similar to that of a regular full body harness but includes specially isolated metal parts to protect electrical linesman and tower workers from electrical arc. All metal components are covered with isolating neoprene covers.

In regards to height systems, like a fully body harness it can be use for both fall arrest and work positioning.

They are used where there is a risk of an electrical shock and are most commonly used by linesman conducing electrical work up power poles etc.

Pole Strap

The purpose of a pole strap is to support a worker on a pole, both during normal working and in the event of a restrained fall. It may be used with a full-body or lower-body harness with suitable attachment points. A personal energy absorber SHALL NOT be used in conjunction with a pole strap, and a pole strap shall not be used wherever there is a possibility of a free fall.

Selection of a suitable pole strap should take into account the following:

a) The need for material other than synthetic webbing or rope, e.g.-

(i) steel wire rope or steel chain, for use where the work entails use of power cutting tools such as saws or grinders: **or**

(ii) natural fibre rope, for use where the work entails both the use of naked flame and where there are live electrical conductors within reach.

b) Ease of connection around a pole and ease of adjustment of length to allow a comfortable working position.

Natural fibre material should not be used for any purpose other than provided for in Item (a)(ii)(above).

The combination of a pole strap with a harness should not be used for work other than pole work, tree climbing, or tower work.

Used as a connection to a harness for work positioning on a pole. Not suitable for free fall or limited free fall situations. A pole strap is attached to a harness by means of the side attachment point at waist level. For this purpose, the harness needs to be the waist strap type.

© IMPAC

How to Fit A Harness

- Layout on clean surface – undo leg straps.
- Check certification etc.
- Put on as if a waistcoat – check for twists.
- Connect chest/waist strap – not too tight.
- Adjust height – rear D-ring position.
- Connect leg straps – no twists.
- Tension leg straps.
- Tuck away all loose webbing.

Inspection Requirements

As per the AS/NZS 1891.1: 2007 standard Safety harness and related equipment covered under the 1891 standard should be inspected and recorded before the first use (from new) and at least once, six monthly there after or after a incident. This inspection should be completed by a competent height safety equipment inspector.

What the inspectors look for:

- Date of Manufacture/destroy-by date.
- Standards (AS/NZS1891.1 2007).
- Current inspection period (6 months).
- Webbing.
- Stitching.
- Hardware.

All height safety equipment should be inspected by the user before use.

© IMPAC

Daily users must check the viability of:

- Attachment points.
- Shoulder straps.
- Front buckle.
- Leg straps.
- Shock absorber and inspection tags.
- Fall arrest attachment points.
- Currency of inspection records (tags, logs etc.).

You will see an example of a daily users basic checklist and a fault register on the following page.

DAILY CHECK SHEET		
Harness	**Equipment Details**	**Lanyards**
	Type of Equipment	What equipment is it? (Harness, lanyard?)
	Serial Number	Normally found on the harness itself and on the manufacturer's details for the lanyard
	Design Standard	This details the standard that the equipment complies to (AS/NZS1891/ EN362 etc.)
	Date of Manufacturer	The day the harness was manufactured
	Destroy-by-date	The day the equipment should be destroyed. (Usually 10 years)

© IMPAC

Harness		Inspection Requirements	Lanyards	
Pass	Fail		Pass	Fail
✓	X		✓	X
		6 monthly inspection date is valid		
		Webbing		
		Stitching		
		Hardware		
NA	NA	Shock Absorber		
Faults: *As recorded in the Fault Register*				
Name *(Full name of inspector)*		**Signature** *(of inspector)*	**Date** *(of inspection)*	

Fault Register

Any faults identified in the daily check sheet requires that the Health and Safety equipment is locked out and tagged out and then listed in a Fault Register like the one below. The item is then passed on to a height safety equipment inspector for further inspection.

Once checked, the inspector is to indicate whether the item remains serviceable (S) or is deemed to be unserviceable (US) and sign the end column.

If found to be US, the item is to be removed from service, tagged and destroyed beyond use.

© IMPAC

FAULT REGISTER					
Item	Component	Description of Fault	S	US	Signature
			✓	X	

© IMPAC

SUMMARY TABLE OF HARNESSES

		
Type of Harness?		
Lower body harness (Seated harness)	**Lineman's harness (Lineman's belt)**	**Safety belt (Work positioning belt)**
Example for the type of work it can be used for?		
Both ladder and pole work and are also commonly used in arboriculture and roof work.	Electrical work	**Pole work/ Arboriculture**
Type of Height System it can be used with?		
Fall arrest (Limited free fall or retrained fall) Work positioning	Fall arrest & Work positioning	Work positioning when used with pole strap. It does not provide fall protection on its own.

© IMPAC

INTERCONNECTING HARDWARE

Hardware is the 'glue' that holds the height system together.

Equipment must be:

- Double action.
- Self-closing.
- Rated above 15kNx.

Karabiners

Also known as a carabiner, it is a coupling link with a safety closure (shortened from the German word, "Karabinerarten", meaning spring hook.)

Characteristics: These comprise of a connector with a spring-loaded locking gate. The gate opens to receive a mating connection and when released, automatically closes to retain the connection.

Advantages:

- Light weight
- Easily manipulated with one hand (Screwgate)
- Versatile and durable
- Speed and ease of opening (Auto lock)
- Rapid auto locking (Auto lock)

Disadvantages:

- Consumes time to lock the sleeve (Screwgate).
- Rubbing and vibrations can unlock the sleeve (Screwgate).
- Risk of forgetting to lock the sleeve on a (Screwgate).
- Two hands are needed to insert a device into the karabiner.
- Tricky sleeve operation (Triple lock).

Karabiners are required under AS/NZS 1891.1 to be self-closing and have a locking device so that the karabiner is only capable of being unlocked and opened by at least two consecutive and deliberate actions.

© IMPAC

Karabiners are commonly made from steel or aluminium alloy.

Personal karabiners on the end of lanyards attaching alloy devices to the operator are normally aluminium alloy to reduce weight. They are opened and closed regularly during operations. Where possible, karabiners should be auto-locking to prevent accidentally leaving them in an open and reduce wear on the locking mechanism (screw threads).

Steel karabiners are preferred for all system use and in shared rigging because they are generally stronger and more robust than karabiners made from other materials in this situation. The additional weight often helps to maintain the correct orientation when installed on anchors, etc.. Steel karabiners may have an increased wear effect on aluminium alloy products around the attachment holes.

When using large volume slings, ensure that the karabiner is oriented to take the larger items at its larger end. Slings stuffed into the tight radius ends of smaller karabiners can cause failure at lower than anticipated forces. Never make chains of karabiners as even a small amount of twisting will cause them to separate. Karabiner gates are the weakest element and cross-loading them can cause failure. Karabiners come in a variety of shapes with distinct advantages for specific uses.

Types of Karabiners

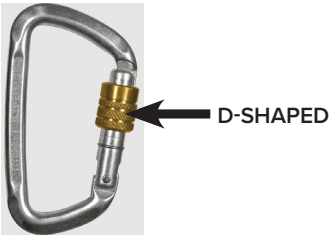
Oval

Oval Karabiners are useful for pulley systems and connecting devices because they sit centrally and in line with any loading. Normally, they have a narrow gate opening and are not recommended for use with larger or multiple slings attached. Ovals are the weakest of all karabiner shapes.

© IMPAC

D-shape and modified-D

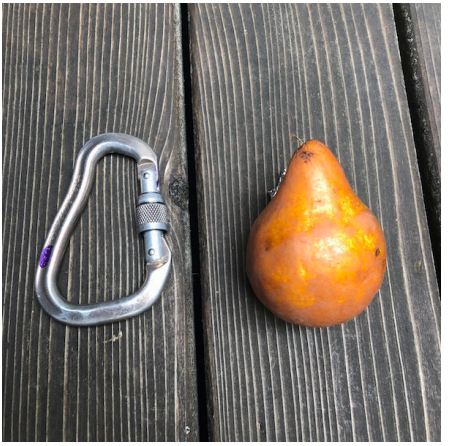
D-shape and modified-D karabiners are the strongest of all shapes because the load is kept close to the spine of the karabiner and away from the gate. These are a good general-purpose karabiner.



Modified D- Shaped (Offset /Asymmetric) work like regular D's, but they're slightly smaller at one end.

Pear shaped and HMS

Pear shaped and HMS karabiners allow for a wide gate opening and offer good load distribution when packing multiple ropes or slings in them. These are good for friction hitches when managing loads. HMS stands for the German word *“Halbmastwurfsicherung”* which means 'half clove hitch’ belay or 'Munter Hitch'. It refers to karabiners that are designed to have rope run over them.



© IMPAC

KARABINER LOCKING MECHANISMS

There are generally three locking mechanisms:

Screwgate: The screw-gate type has a short barrel-type locking sleeve that is manually screwed into the locking position.

Twist or auto-locking (double lock): Twist or auto-locking types, in which a spring-loaded barrel automatically locks into position, comes in two variations, twist-locks, that require a twisting action to unlock the gate before it can be opened.

Triple-lock: Triple-lock, which require a further lifting action in addition to the above.

Tube-nut Connectors

These comprise an open loop, the sides of the opening terminating in a pair of aligned screw threads arranged so that a single tubular nut can close the loop by simultaneously engaging both threads. Tube-nut connectors are among the safest types of attachments hardware in that they require a succession of screwing actions to open them, and they are not prone to roll-out as are other connectors which rely on spring mechanism for security. They can be further secured by the use of a spanner or a thread adhesive. Because the locking mechanism is slow to operate, they are not suitable at the anchorage end of a lanyard assembly. They are suitable at the harness end of a lanyard assembly, providing operators do not frequently need to disconnect them from the harness. The triangular type is suitable for three-way loading such as connecting anchorage sling ends together.

N.b. A tube nut connector is not classified as a karabiner or snaphook, therefore it doesn't have to comply to the requirement for two separate opening/closing actions, nor is it required to be self-closing or self-locking.

© IMPAC

Snap / Scaff hooks

These comprise a hook-shaped body and gate. The gate can be opened to receive a suitable and compatible attachment point such as a ring on a harness, or the eye of a lanyard or sling. The snap hook is required under AS/NZS 1891.1 to be of the self- closing and self-locking type, which has a locking gate overriding the latch that remains closed until the hook is intentionally unlocked and opened by means of two actions.

ROPE

Applicable standards for rope are EN 1891, AS/NZS 4142.3 & EN892. Rope can often form the link between a harness and anchor point. Only ropes made from man-made fibres are suitable, the most commonly used being Kernmantle rope

KERNMANTLE ROPE

Kernmantle rope is made up of the following components:

- An internal core (kern) that is constructed of continuous nylon filaments. Each filament can support 100kgs. The kern is the main load-bearing section, and is responsible for 80 per cent of the rope's strength

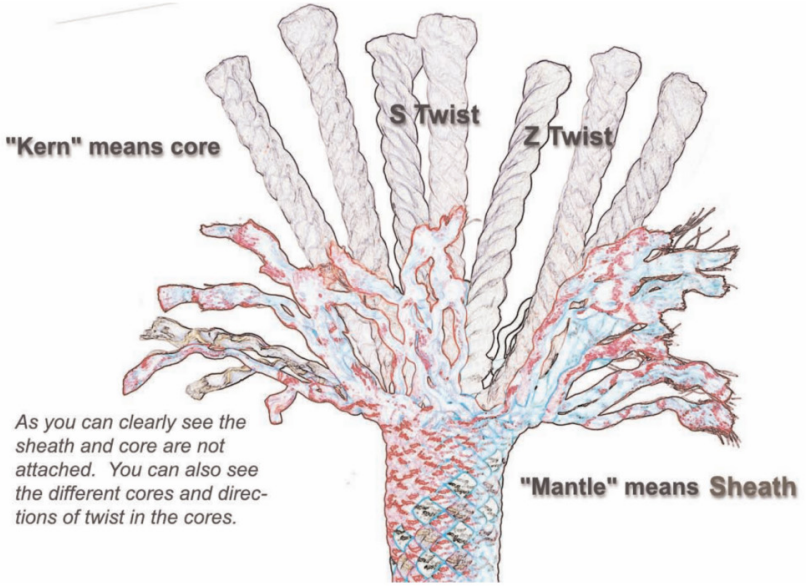
- A braided nylon external sheath (mantle) designed to protect the kern against abrasion and other damage.

Kernmantle ropes are available in two types:

- **Static:** This type is abrasion resistant and has a very low ability to absorb energy. In simple terms, it doesn't stretch. It is primarily used for fall arrest and industrial rope access. The mantle of static rope is a much tighter weave than that of dynamic rope.

- **Dynamic:** This type has relatively low abrasion resistance and a high energy absorption capacity. It is primarily used for technical climbing and is a built-in shock absorber for the climber. In simple terms, it stretches.

© IMPAC



The basic requirements for a fall arrest rope are:

- Kernmantle construction.
- Static rope.
- 0.5mm minimum diameter, as per AS/NZS 1891.4.
- 3000kg minimum breaking strain.
- Meet the requirements of AS/NZS1891.4 or EN 1891 or other internationally recognised standard.

Work Examples for Rope Systems

- Rope is commonly used with FAD type 1 device (rope grab).
- Roof Inspections.
- Rope access related work (arboriculture, window cleaning etc.).
- Surveying plant.
- Vertical access/egress.

© IMPAC

Advantages of rope

- Low-cost equipment.
- Less complicated equipment.
- Less intensive labour requirements.

Disadvantages:

- Can be cut or frayed.
- Can be the wrong size / length /diameter.
- Less flexibility regarding who can use the system.
- Practical limits to rope access.

ROPE INSPECTION

As with all other height safety equipment, ropes must be inspected regularly to ensure they remain safe to use and that they are fit for purpose, e.g. the right rope for the job.

Ropes should be checked daily by the user and must also undergo a more formal inspection every six months by a competent person. Six-monthly checks must be recorded. Rope inspections include both administrative and physical checks.

Administrative checks include:

- Date of manufacture (DOM) and expiry date. Most ropes have a ten-year life span unless the manufacturer's specification states otherwise.
- Safety standard (e.g. AS/NZS 4488.1 and 2).
- Serial number – this is vital for history keeping and any product recall.

Physical checks must focus on the entire length of the rope and any attachments. Areas of consideration will include cuts, tears, frays, abrasion damage; broken, cut or worn threads; glazing or crispiness due to friction, heat damage or chemical contamination; lumps due to grit or dirt; excessive stretching or shock loading; burns; damage or deterioration as a result of exposure to water (rotting), heat, UV light, corrosives, solvents, fuels or paint.

If in doubt, tag it out or condemn it. Follow company procedures or the manufacturer's technical instructions regarding condemning of equipment. All condemned equipment is to be disposed of safely and in a way that prevents it from being returned to use. This must be recorded.

© IMPAC

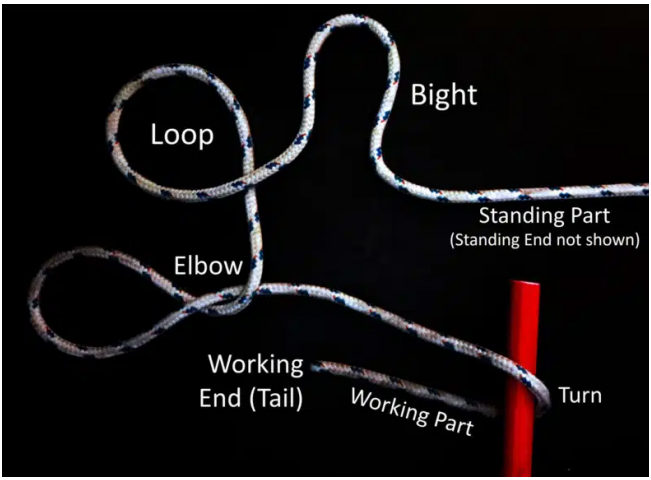
KNOTS

Knots should be chosen that are suitable for the intended use. Take into consideration the ease of tying, untying and inspection. An experienced operator should check all knots. Basic rope activities will require the knowledge of at least one of each type as appropriate to the job. Knots can be classified according to their function within the system.

Common Knots in Heights Systems:

Definitions:

- **Bight** - A fold in the rope or U-shaped section of rope being used in making a knot. The two parts lie alongside each other – they do not cross each other.
- **Loop** – Formed by crossing the line over on itself.
- **Dress** – Arranging the knot in a way to improve its performance such as crossing or uncrossing the rope in specific ways.
- **Set** – Process of tightening the knot. If a knot is not set properly, it can cause it to underperform or loosen.
- **Standing part** - The main part of the line – used for raising or lowering
- **Working end** - The free end of the line usually used to form knots



© IMPAC

Common Knots in Height Systems

- Figure 8 (single).
- Figure 8 on the bite (double figure 8)
- Threaded Figure 8.
- Alpine Butterfly.

There are many more knots that can be used in height work or other applications. These knots have a variety of applications, but the following is a general guide.

Anchors

- Figure 8 doubled on a bight.
- Figure 8 rethread.
- Figure 9.

Life support

- Figure 8 rethread (direct connection to the rope).
- Barrel (1/2 double fisherman's back on itself for lanyards).

Rigging

- Alpine butterfly (making a three-way connection or isolating section of rope).
- Clove hitch (for round objects, temporary set-ups, back clipping of lanyards).
- Italian hitch (friction knot for control of hauling, lowering).
- Prussic (classic and Klemeist).
- Double fisherman's (joining ropes and cords).
- Stopper knot (single figure 8 or barrel/fisherman's knot).
- Rolling hitch (for tying on tube for hauling).
- Timber hitch (for tying on timber planks for hauling).
- Sheet bend (join throw lines to the mainline).
- Bowline (quick attachment of objects to a line for hauling).
- Tape knot (tying tape into slings).

© IMPAC

FIGURE 8.

1

2

3

4

© IMPAC

FIGURE 8 ON THE BIGHT

1

2

3

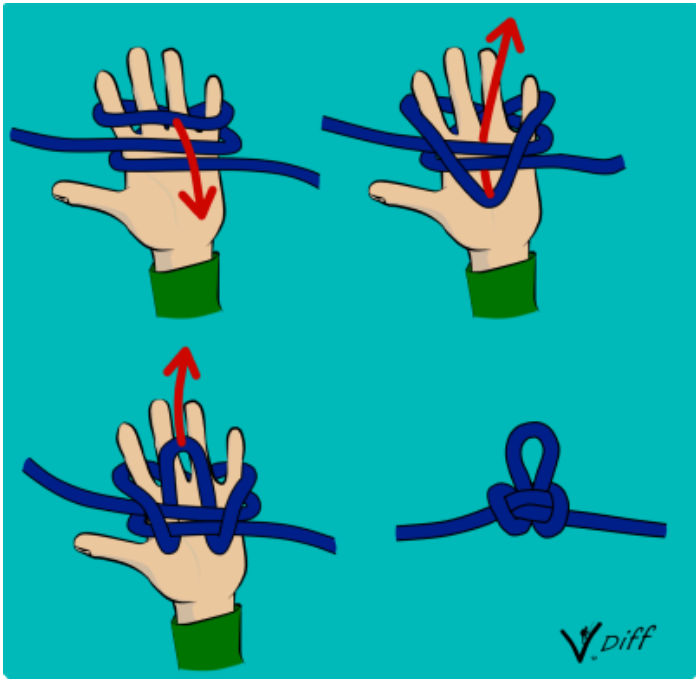
4

5

© IMPAC

ALPINE BUTTERFLY

An alternative way to tie the alpine butterfly is to wrap it around your hand three times as shown below. Pull the top wrap down over the other two, then back up behind them.



© IMPAC

LADDERS AND PLATFORMS

LADDERS

Essentially a ladder is a climbing device consisting of two side rails called stiles, joined at regular intervals by crosspieces called steps, rungs or cleats, on which a person may step in ascending or descending manner. Portable ladders are designed as "one-man" working devices with sufficient strength to support the person as well as his tools and materials.

Ladders and step ladders do not offer fall protection and therefore should be the last form of work access equipment to be considered. Ladders and stepladders should be of trade or industrial standard and rated at not less than 120kg. In New Zealand, industrial-use ladders should be compliant with the **AS/NZS 1892.1 standard.**

The biggest hazards associated with ladders come about due to an incorrect use of the ladder and the selection of unsuitable ladders for a job.

Hazards Associated with Ladder Use

The biggest hazards associated with ladders come about due to an incorrect use of the ladder and the selection of unsuitable ladders for a job.

To assist you deciding whether a ladder is the correct piece of equipment for the task at hand ask yourself the following questions?

1. Is it light work?

2. Is the person setting up the ladder, trained, or supervised to work safely?

3. Is the ladder in good condition- rungs, feet, stiles?

4. The combined weight of the user and his equipment.

5. The environment in which the ladder is to be used, i.e. a corrosive or electrical alive environment.

6. The reach of the ladder.

7. Can the ladder be positioned and secured to prevent movement?

User maintaining three points of contact

Overreaching and not maintaining three points of contact

Note: If you answer no to any of these questions then there's a good chance that it's not the correct piece of equipment for the job.

Ladders and stepladders should be used for low-risk and short-duration tasks. The user should maintain three points of contact with a ladder or stepladder to reduce the likelihood of slipping and falling.

Ladders should be:

- Clearly labelled as complying with **AS/NZS 1892.1:1996.**
- Structurally sound.
- Free of defects.
- Not covered in chemicals or other materials (such as paint) that might obscure any damage or defects (such as splits or cracks).

© IMPAC

Ladder set up

✚ Always read the instructions before you use a ladder.

✚ Check for the standards approved label (AS/NZS1892.1 1996).

✚ Use a ladder with slip-resistant feet and ask someone to hold it steady. Alternatively, steady the ladder with sandbags or nail a solid piece of wood into the ground so that the ladder feet rest against this for support.

✚ Place the ladder on firm solid ground.

✚ Straight ladders should be one metre out at the base for every four meters of height.

✚ Ensure the ladder extends one meter above the landing place, for example the roof line.

✚ Ensure the ladder is at least 4 metres clear of power lines.

✚ If possible, tie a straight ladder to something stable as close to where it rests on the wall to prevent movement.

✚ Stepladders should be fully open, and both stay bars locked in place.

✚ At least 3 rungs past the point of access.

Other Hazards

✚ There are other hazards associated with ladders that people often forget about. These hazards make ladder work dangerous for others around the workplace or work-site, not simply the user. (Example; adverse weather)

✚ Falling items, for example, can seriously injure other people who are beneath someone using a ladder.

✚ Think about overhead obstructions such as power lines, steel beams etc.

© IMPAC

Limitations for Ladder or Stepladder Use

✚ **Overload** – the person and anything they are taking up should not exceed the highest safe working load stated on the ladder.

✚ **Over-reach** – keep the line of the belt buckle inside the stiles with both feet on the same rung throughout the task.

✚ **Do not** – keep tools or other items resting on the steps or hanging from the rungs.

✚ **Carry** – tools on a tool belt.

✚ **Stop** – at the third step from the top of a straight ladder.

Working from Stepladders

✚ When working from stepladders, avoid work that imposes side loading, such as side-on drilling through solid materials. Face the steps of the ladder towards the work activity.

✚ Where side-on loadings cannot be avoided, prevent the stepladder from tipping over by tying the steps to a suitable point, or use a more stable type of access equipment.

✚ Avoid holding items when climbing ladders and stepladders by using a tool belt.

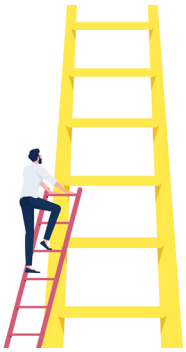
© IMPAC

On a Stepladder where a handhold cannot be maintained, the use of a stepladder should take into account:

- The height of the task.
- Whether a safe handhold is available on the stepladder.
- Whether it is light work.
- Whether it avoids side loading.
- Whether it avoids overreaching.
- Whether the user's feet are fully supported.
- Whether the stepladder can be tied.
- Location – away from driveways and doorways.
- Distance – minimum of four metres' clearance from electricity lines.
- Use of hand tools that require a high level of leverage.

When in use, the portable leaning ladder should:

- Rest against a solid surface at the top
- Rise at least one metre or three rungs above the landing point
- Be positioned so users do not have to overreach or climb over obstacles (users should be able to do the job with both feet and one hand on the ladder)
- Rest on firm, level ground
- Be in good condition and free from slippery substances
- Be used with adequate clearance from traffic routes
- Be at an angle of one metre out for every four metres up (i.e. a 4:1 ratio).



© IMPAC

Work Examples for Ladders:

- Minor maintenance
- Changing light-bulb
- Window cleaning

Advantages

- Mobility
- Ease of access (Quick set up)

Disadvantages

- Finding a suitable spot to foot the ladder
- Different ladder required for different types of jobs
- Can only be used for short duration work

Ladder Inspection – Before and During Use

All ladders should be inspected on a regular basis and be well maintained. Ladders that are defective should be removed from service until repaired or, if this is not possible, they should be destroyed. Ladders awaiting repair should be suitably labelled. The following should be checked before using a ladder and after any incident (e.g. ladder being dropped):

- Last inspection (12-monthly).
- Standards (AS/NZS 1892.1).
- Attachment to structure (fixed ladders).
- Braces/side stays – secure and locked off.
- Metalwork is straight – stiles/rungs/runners/braces.
- Rivets/bolts – present and secure.
- Foot pads/caps present – in good condition and securely fastened.

© IMPAC

- Corrosion/chemical damage
- Cracks/splintering/wear and tear
- Rungs and side struts to be in good repair – not bent or damaged
- Wooden ladders – not to be painted or covered to obscure damage
- Use the 4:1 ratio when positioning, i.e. one metre out for every four metres up
- Straight ladders to extend one metre or three rungs above egress level
- Extension ladders to have a minimum of a three-rung overlap
- Beware of overhead power lines – use only wooden or fibreglass ladders around power lines
- Do not climb further than the third-to-top rung on a stepladder
- Do not overreach
- Do not sit on a ladder
- Tie off top of ladder
- Foot the ladder until tied off and ensure ladder is set up on solid and even ground.

NOTE: Do not repair ladders unless you are competent to do so.

© IMPAC

Basic dos and don’t s

Do’s

- Ensure right size ladder for the work.
- Ensure safe erection angle (4:1 ratio).
- Inspect prior to use.
- Extend 3 rungs (1m) above egress.
- Foot the ladder and tie off at the top.
- Set up on solid even ground.

Don’t s

- Paint ladders.
- Place close to power lines.
- Sit on or over-reach.
- Climb higher than 3rd rung from the top.

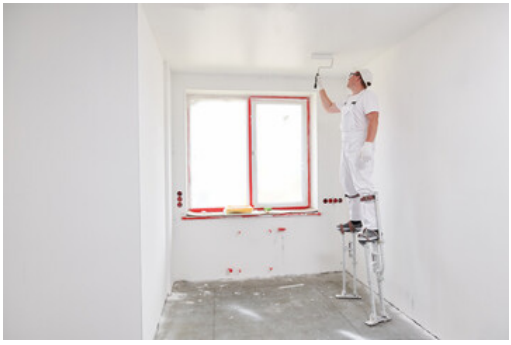
© IMPAC

STILTS

These aids enable a construction worker to access elevated areas while applying tape, finishing, and adding texture to plasterboard within a building's interior. Additionally, these stilts can serve other purposes in construction tasks. However, it's crucial not to use them on scaffolding or any other equipment designed for elevating workers. Ensure that the stilts are used on flat surfaces free of debris or construction materials, with covered openings. It's essential to maintain the stilts properly according to the manufacturer's guidelines between uses. Using stilts raises a worker's center of gravity, decreasing stability and increasing the risk of tripping, losing balance, or falling through floor or wall openings. Only workers proficient in the specific type of stilts should be allowed to use them.

For the safe use of stilts:

- Inspect the stilts every time before use.
- Use only on hard, level surfaces.
- Clear the area where workers will be working on stilts of any debris or construction materials.
- Provide barriers across any openings such as doors or windows that could create a fall hazard.
- Work directly over the stilts without reaching or leaning the body.
- Limit the amount of weight carried while working on the stilts.



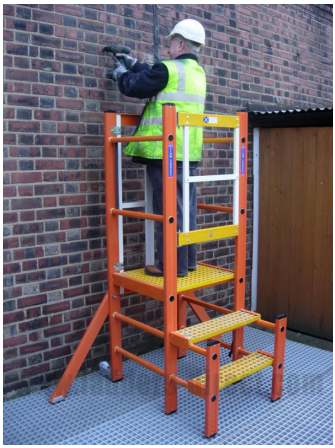
© IMPAC

HOP UP TRESTLES / PODIUM / FOLDING / AND STEP-UP PLATFORMS

These platforms come in a variety of design configurations and may be of a fixed height or have adjustable deck heights.

Podiums include full guardrails handrails and include edge protection.

Folding or step-up/hop-up platforms with no edge protection are generally intended for short-term interior work. They should be used on firm level ground. If used outside on soft ground, sole boards should be used to ensure the podium platform is stable.



TRESTLE SCAFFOLD

These are only suitable for low-level work because of the difficulty of incorporating a guardrail system. An example of low-level work is when the worker may need to paint a low ceiling. Guardrail systems are available for trestles and should be used wherever possible.

Trestles without a guardrail system should only be used when the duty holder's hazard management systems show that the likelihood of a person falling and injuring themselves is low and the work is of short duration. The risk assessment also must show that other alternative controls that give more protection cannot be used.

© IMPAC

TRESTLE SCAFFOLD (CONT.)

These are only suitable for low-level work because of the difficulty of incorporating a guardrail system. An example of low-level work is when the worker may need to paint a low ceiling. Guardrail systems are available for trestles and should be used wherever possible.

Trestles without a guardrail system should only be used when the duty holder's hazard management systems show that the likelihood of a person falling and injuring themselves is low and the work is of short duration. The risk assessment also must show that other alternative controls that give more protection cannot be used.

Steel or aluminium fold-out trestles are used in conjunction with scaffold boards or staging. These trestles shall be manufactured and used in accordance with AS/NZS 1892.1 Portable Ladders. Another form of trestle is a self-supporting stand including horizontal members designed to support one end of a light-duty work platform. It may be folding or telescopic. The design and construction of these trestles shall comply with AS/NZS 1576.5 or other accepted international standards.

© IMPAC

STEP PLATFORM/NON-FIXED ACCESS WAY/ TEMP ACCESS PLATFORM

A step platform provides a safer alternative to a stepladder, or especially where the task involves working at height for extended periods or with restricted vision (such as welding or other hot work).

The step platform is more stable and provides a much larger work surface than the stepladder. Some models are collapsible and should comply with AS/NZS 1892.1.

MOBILE SCAFFOLD TOWERS / MOBILE PLATFORMS

A mobile scaffold is a special type of free- standing scaffold supported on wheels, castors or other devices for ease of movement on a firm, level surface.

Components and systems that can be used to construct mobile scaffolds include:

- Aluminium prefabricated systems.
- Fibreglass prefabricated systems (nonconductive).
- Steel frame scaffolds ('H' frame).
- System or modular steel scaffolds.
- Tube and coupler scaffolds.

Mobile scaffold towers generally need to be braced on all sides. They should be plan braced to prevent twisting or racking unless the lowest fully-decked platform is less than 3 m high.

Mobile scaffolds are particularly prone to tipping over while in use. In order to improve stability:

- Position the scaffold as close as possible to the area being worked on.
- Apply the castor brakes while the scaffold is in use.
- Use outrigger bracing or larger base frames to increase the minimum base dimension.
- Add weight to the scaffold base to improve stability.

© IMPAC

MAKESHIFT WORK PLATFORMS

The design, creation, and installation of temporary makeshift work platforms using building materials must adhere to sound design and construction principles outlined in established construction standards such as Scaffolding, Access, and Rigging New Zealand (SARNZ) and/or the Good Practice Guidelines for Scaffolding in New Zealand.

When construction workers build their own work platforms, they must ensure that:

- No alternative work platforms are readily available.
- The platforms are made from appropriate materials.
- Competent and skilled tradespeople either construct or supervise the platform's construction.
- The proposed structure can securely support the workers, materials, and equipment required for the task.
- Guardrails, toe boards, and mid rails are installed.
- The proposed structure can withstand the construction activities and processes necessary for safely completing the work.
- Temporary work platforms should never be made from construction materials such as pallets, bricks, concrete blocks, buckets or barrels, furniture, nail boxes, or packing crates.
- The platform's width should be a minimum of 675 mm. The narrowest width should never be less than half of its height from the ground at the highest point.
- The span between supports should not exceed the recommended specifications outlined in the Best Practice Guidelines for Scaffolding in New Zealand.
- For timber platforms, the maximum working load should be in line with the light-duty loading outlined in the Best Practice Guidelines for Scaffolding in New Zealand.

© IMPAC

PERMANENT FIXED ACCESS WORKING PLATFORMS

Permanent access way / fixed roof ladders (crawl boards)

A permanent access pathway provides workers with a safe route to reach their designated work area. Fixed roof ladders and crawl boards serve a similar purpose by offering permanent access to a work positioning system or providing access to service plant on pitched or brittle roofs.

Crawl boards must be at least 450 mm wide and ideally equipped with handrails. On brittle roofs, guardrails should be permanently affixed to crawl boards and/or fixed roof ladders. Crawl boards should feature a non-slip surface or cleats, depending on their slope. It's essential to ensure that permanent access adheres to the regulations outlined in the Building Act 2004.

Temporary roof ladders and crawl boards should meet the same standards as permanent installations. Roof ladders are suitable for roof pitches exceeding 25 degrees. The bracket at the top of a crawl board or roof ladder should extend sufficiently to cover the ridge and overlap the roof framing. However, when crawl boards are used independently, they do not prevent falls. If there's still a risk of falling while using crawl boards, additional precautions such as edge protection and/or fall restraint systems may be necessary.

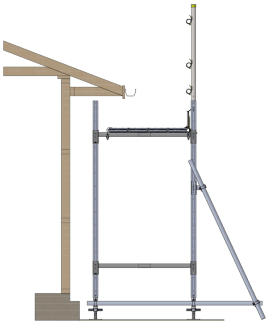
Permanent / fixed access steps (stairway)

Access steps are an important part of ensuring safe and easy access to a building or other area. Fixed or permanent access steps are stairs that are permanently attached to a structure, as opposed to portable or temporary steps. There are many benefits to having fixed access steps, including increased safety and ease of use. Fixed access steps are less likely to be moved or dislodged, and they can be easily customized to the specific needs of the user. In addition, fixed access steps can be designed to blend in with the surrounding architecture, making them an aesthetically pleasing option.

© IMPAC

PERMANENT FIXED ACCESS WORKING PLATFORMS (CONT.)

Free-standing Scaffold



A free-standing scaffold is a semi-permanent structure that stands independently without being attached to any other building or framework. It maintains stability against tipping over either independently or with the assistance of diagonal braces and anchors, ensuring secure placement. Optional foot ties may be utilized as an additional precaution, or it may be anchored directly into the ground for added stability.

General Requirements for Free Standing Scaffold Platforms

Working platforms may be designed for either light duty or heavy-duty loading and are normally restricted to one per scaffold. Stability is dependent on the ratio of height to the least width of base, and this must not exceed three, unless the special requirements are complied with. Raker frames may be included as part of the minimum base dimension.

Diagonal bracing is necessary on both faces and ends, except where frames with adequate built-in stiffness are used for one or two lifts in height. In these cases, face bracing alone will be adequate.

Access and egress from working platform to base must be provided. **A free-standing scaffold may be converted temporarily into a laterally supported standing scaffold:**

- To support more than one working platform.

- To increase the height-to-width ratio, provided the converted scaffold with ties or rakers meets the code requirements for strength and stability.

Free-standing scaffold frames must be adequately restrained from vertical separation due to accidental causes.

© IMPAC

Mechanical Access plant / (Mobile) Elevating work platforms (M)EWPs

Mechanical access plant includes all mechanically operated plant that can be used to gain access for the purpose of working at height. Commonly used mechanical access plants (M)EWPs include:

- Vehicle extension arms.
- Truck-mounted lift.
- Trailer-mounted lift.
- Self-propelled (knuckle boom lifts).
- Scissor Lifts.

These mechanical access plants are specialised pieces of equipment often designed for particular types of operation. It is essential that the correct type of machine is selected for the intended work. The operator must be competent to operate the type of mechanical access plant / (M)EWP. It is essential that these types of mechanical access plant are operated within the manufacturer's guidelines.

There are some key safety issues that should be considered before using mechanical access plant. Some (M)EWPs are designed for hard flat surfaces only, while others are designed for operating on rough and uneven terrain. Units powered by internal combustion engines are not suitable for use in buildings or areas with poor natural ventilation unless appropriate artificial ventilation is provided.

According to Best practice guidelines for working at height in New Zealand all (M)EWPs:

- Need to be clearly marked with the rated lifting capacity.
- Need to have a six-monthly inspection certificate displayed.

Before use the operator should ensure that:

- The MEWP has been inspected and tested within the previous six months.
- The MEWP is set up level and on firm surfaces.
- Hazards associated with power lines are appropriately controlled.
- The MEWP will not create a hazard, e.g., the boom will not swing out into the path of other vehicles.

© IMPAC

Self-Propelled (Knuckle Boom Lift)

A knuckle boom has a second articulated joint partway along the arm to allow for extra flexibility and reach for the work platform. The arm can be folded away when not in use, and to vary the reach in use. Knuckle booms should be used and maintained in accordance with the Best Practice Guidelines for Mobile Elevating Work Platforms. If an extension arm is attached to a MEWP, a design certificate from a chartered professional engineer (CPEng) with experience in this field shall be obtained. Such certificates shall show that the platform meets the criteria in AS 2359.1 Powered industrial trucks - General requirements. This is important in consideration to the stability, strength and safety, provision of operating instructions and rated capacity.

Further information on the safe use of MEWPs is provided in the AS 2550.10 Cranes, hoists and winches – Safe use – Mobile elevating work platforms.

TYPES OF HAZARDS ASSOCIATES WITH (M)EWPS

Falls from height	High winds and rain	Power Lines
Falling Objects	UV Exposure (the sun)	Overloading
Overhead objects	Temperature	Slips and trips
Entrapment	Moving vehicles	Dust
Crushed Fingers	Pedestrians	Mechanical Failure
Underground Services	Uneven surfaces	Slew controls

© IMPAC

TYPES OF HAZARDS ASSOCIATES WITH (M)EWPS

Utilization of Harness Systems in (Mobile) Elevating Work Platforms (MEWPs) and Safety Cages

Section 3.3 of the Best Practice Guidelines for MEWPs offers explicit guidance regarding the application of harnesses in MEWPs.

Note: Despite the guidance provided below, we strongly recommend that operators of all MEWPs, including scissor lifts, wear a harness to mitigate the risk of falling from the platform.

Operators are advised against overreaching or climbing over the rails of the MEWP platform to access a work area. Both feet should remain firmly planted on the work platform.

Scissor lifts and other types of elevating work platforms, such as self-propelled boom lifts, can serve as access points to a work area. In such instances, the worker should be safeguarded by a double lanyard system secured to a certified anchor point. On a scissor lift, wearing a harness is advised unless a thorough risk assessment has conclusively demonstrated that the work can be executed without one and there's no danger of falling. It's imperative to adhere to the manufacturer's instructions as well.

© IMPAC

SAFETY CAGES (MAN CAGES) / FORKLIFT WORK PLATFORMS

Safety cages (man cages) are work platforms that are constructed to be raised or lowered using a forklift and they should be used in accordance with the Approved Code of Practice for Training Operators and Instructors of Powered Industrial Lift Trucks (Forklifts) – MBIE. Non-integrated work platforms should be designed for the specific model of forklift truck.

Forklift work platforms (safety cages) should:

- Be made in accordance with Australian Standard AS 2359.1, Powered Industrial Trucks- General requirements, and be fitted with guardrails, mid rails and kickboards.

- Only have gates that open inwards and that are installed with a spring-loaded latch.

- Have a two-metre-high guard that is sufficiently wide to prevent any contact with the lifting mechanism fitted to the back of the platform.

- Be operated with the tilt lever on the forklift controls locked out or made inoperable; alternatively, a fall-restraint system comprising a full harness and short lanyard, allowing free movement only within the platform confines.

- Have operating instructions available.

- Have the safe working load displayed in a prominent position.

© IMPAC

✚ Have the platform secured to the forks in such a way that it cannot tilt, slide or be displaced.

✚ Only be used by a competent forklift operator.

✚ Only be used while an operator is at the controls of the forklift or there is an independent means of access to and egress from the platform.

Work Example of Safety Cages (man cages) / Forklift work platforms

✚ Storage / maintenance/ stock picking in warehouse /conducting inspections/ temporary access.

Advantage

✚ More stable than other types of temporary platforms.

✚ More affordable than other mechanical plant (M)EWPs.

Disadvantage

✚ Cannot be self operated.

✚ Unable to access some work areas due to height limit and manoeuvrability issues.

CRANE LIFT PLATFORMS

In cases where no other practical or suitable method is available, a working platform may be suspended from a crane, with the worker securely attached to the hook. It is essential for both the crane operator and the individual using the platform to discuss the operation thoroughly and maintain constant communication, either through direct line of sight or telecommunication.

For further guidance, please consult AS/NZS 2550.1 Cranes, Hoists and Winches; the Approved Code of Practice for Cranes; the Crane Safety Manual from the Crane Association of New Zealand; NZS 3404 – The Steel Structures Standard; and NZS/ASME/ANSI B56.1 Safety Standard for Low and High Lift Trucks.

© IMPAC

NOTES

© IMPAC

EMERGENCY PROCEDURES AND RESCUE

LEGISLATIVE REQUIREMENTS FOR EMERGENCY RESCUES

Anyone planning to work at height has a legal and moral obligation to ensure that any worker can be effectively rescued in an emergency situation

The Health and Safety At Work Act 2015

Section 36 of the Act states that the PCBU must ensure the health and safety of workers and other people while at the workplace.

Ensuring safety includes having emergency procedures and systems in place for specific emergencies.

General Risk and Workplace Management Regulations 2016

The requirements around emergency plans are given in Regulation 14 of the GRWM Regs.

14	**Duty to prepare, maintain, and implement emergency plan**
(1)	The PCBU at a workplace must ensure that an emergency plan is prepared for the workplace.
(3)	The PCBU at a workplace must maintain the emergency plan for the workplace so that it remains effective.
(5)	The PCBU at a workplace must implement the emergency plan for the workplace in the event of an emergency.

© IMPAC

The emergency plan must also allow for regular testing of emergency procedures, specifying how often this will happen. Testing will indicate any flaws in the procedures and allow the PCBU to make necessary changes, so the procedure is always effective.

Information, training and instruction about the emergency procedures must also be effectively communicated to all workers.

Types of Emergencies

The types of emergency events that may necessitate the emergency plan to be activated include, but may not be limited to, the following:

- Arrested falls leading to suspension trauma.
- Impact from falling object(s).
- Equipment failure, structural collapse.
- Impact with structure (during fall or pendulum swing).
- Medical emergency (heart attack, fainting, seizure etc.).
- Entrapment.

The Suspended Faller / Harness Suspension Trauma and Fainting

The human heart can only push blood. When upright the body relies on body movement to assist the flow of blood from the legs back up to the heart and head. Leg muscles squeeze during movement and non-return valves in the veins ensure the blood only moves up in stages, like floors in a lift. When not moving, blood starts to pool in the legs and this lowers the oxygen in the brain. This results in fainting, which is designed to put us in a safe horizontal position. But because the faller is suspended, only the head falls down. This can also block the airway, and can be fatal.

For many years a rescue window of only 10 minutes has been recommended after the fall, which is not a long time, so preparation is key.

© IMPAC

Symptoms of an Impending Faint

If the suspended faller feels the following, they are about to faint:

- Light-headedness.
- Nausea.
- Tingling in limbs.
- Anxiety.

Immediate action must be taken to protect or rescue the faller before the airway becomes blocked. Injury, illness and pressure from harness leg straps can speed up the process and must be assessed.

Buying Time

Ortho-static intolerance is the correct medical name for the condition often known as suspension trauma.

Ortho means **upright** and static means **not moving**. If we can deal with these issues, then we can buy time for the casualty and avoid the faint.

Trauma relief straps give a resistance point to move against for sustainable movement. They make it easier to squeeze the leg muscles and move blood.

Another option is a one-metre anchor sling behind the knees that is clipped to the front of the harness to raise the faller into a **seated position**. The seated position is another way to avoid the fainting, with some harnesses having this option built.

© IMPAC

Self-rescue

Options for the casualty to help themselves

This is NOT an excuse to work alone

Typical scenarios might include:

Suspended faller

- Minor injury at height
- Feeling unwell
- Unsafe structure
- Weather changes

Worker can climb or walk out safely using safety rope,

fall arrest device (FAD), ladders, static line, lanyards etc.

NOTE: If the casualty is unable to self-rescue unaided, then the safety crew must take immediate action to support and initiate rescue.

© IMPAC

Assisted-Rescue

Immediate action by the safety crew

Rescue plan for the assessment, rescue and treatment of a casualty

Typical scenarios might include:

- Suspended faller (suspension trauma)
- Injury from slip or fall
- Pendulum swing into object or structure
- Worker unwell
- Falling object impact
- Collapsed/damaged structure
- MEWP breakdown.

Rescue options may include use of suitable retrieval equipment, such as:

- Lanyard rescue kit
- Mechanical/electric hoist
- Tripod and winch (type 3 FAD)
- Rope pulley/mini haul system etc
- Support with ladder, scaffold tower.

Action once casualty is retrieved:

- Withdraw entrant to safe area away from hazards
- Confirm whether casualty is fit and well (render first aid if needed)
- Preserve scene for investigation
- Record actions on permit, investigation report.

© IMPAC

Recovery Methods

The recovery method will depend on the type of job and the fall-arrest equipment being used, it could be a method for self-rescue (Prusik method), dedicated rescue equipment (such as the Rollgliss R250 rescue kit) or maybe as simple as having a MEWP on standby.

Whatever method is used it must be **planned**, **organised** and **rehearsed**.

Rescue Kits

Many manufacturers of safety equipment now make specific kits for rescuing suspended fallers. Many are focused on reaching down with a pole from above to attach a rescue line to the faller's harness.

A hauling (pully) system allows lifting of the casualty and release of the faller's lanyard, before lowering them to another level or the ground for casualty care.

N.b. A pre-rigged retrieval system is a good way of ensuring prompt rescue.

Trained Rescuers

Onsite trained rescuers may be available for rope access and rescue. This requires a high level of competency and should not be attempted unless fully trained and equipped.

Early 111 calls should be made for Fire Service support (access, rescue and initial medical care) and Ambulance for handover to final medical care and patient transport.

Emergency Planning

In an emergency situation, the safety team must be competent and confident to assess an emergency and take the appropriate action. Practice and testing are key to an effective response.

© IMPAC

Suitable standby actions during an emergency:

- Do not put yourself in danger!
- Ensure your own safety first, stay disciplined, stick to the plan
- Assess the area and secure any obvious sources of harm (if it is safe to do so)
- Prevent unauthorised access.
- Call for assistance – other team members, onsite emergency rescue team (ERT), offsite emergency services.
- Assess, access, and retrieve the casualty if possible.
- Apply first aid and CPR as necessary.
- Remain in constant communication with casualty throughout.
- Secure the scene to prevent further harm and to enable post-rescue investigation (internal procedures and WorkSafe investigation as required).

The safe system of work is designed through thorough risk assessment of the task, process and area hazards. Using this information, a specific set of rescue plans can be made to meet each possible scenario.

During planning phase you should consider:

- Possibility of rescue from below or above the casualty.
- Equipment and plant available (i.e the use of the crane or MEWP).
- Level of training and confidence.
- Urgency of rescue/timeframe.
- Hazards during rescue to casualty and rescuers.
- Medical assessment, treatment and equipment.
- rained rescuer and emergency services support.
- Communication systems.
- Site access.
- Existing company procedures.

© IMPAC

The Emergency/Rescue Plans

An emergency plan outlines the actions required of all onsite personnel and must be accessible to all personnel onsite. The emergency plan must be easy for everyone to understand and effective immediately if required. An emergency plan must be developed prior to an emergency occurring.

A rescue plan should be developed before installing the harness system. It is critical that a suspended worker can be promptly rescued. Nb. Workers using fall-arrest systems must never work alone.

A rescue plan should be based on the following:

- The likely emergency conditions that could occur.
- The specific hazards likely to be encountered.
- The suitable response required.

Questions that need to be asked include, but are not limited to, the following:

- What are the likely emergency scenarios on your site?
- Would you have a height rescue team? If yes, what training, equipment and access to personnel is required?
- What is the system of communications to raise the alarm and contact outside help?
- Emergency services – who and how will they be contacted?
- First aid – what training has been undertaken, is it current, is suitable equipment available on site?
- How many drills are needed in a year?

All rescue plans must be:

- Planned – documented to ensure a coordinated approach
- Organised – specific duties and actions assigned
- Rehearsed – practised to ensure the plan works as planned and equipment used is fit for purpose.

© IMPAC

RESPONSIBILITIES OF INDIVIDUALS INVOLVED IN RESCUE

Team Leader

(i.e. normally the task supervisor)

The person who will take control of co-ordinating the rescue plan and who will issue instruction to participants in the rescue effort. The Team Leader may also be the Safety Observer; however this role may be allocated to another person.

Trained Specialists

Persons who are trained and designated to carry out specific duties as part of the rescue plan to recover a suspended person after a fall such as:

- Safety Observer

Ensures the area is kept clear, keeps bystanders/other workers away from area and watches and check on team members to ensure overall safety.

- First Aider

Someone who holds a current qualification n performing basic first aid.

- Rescuer

Holds an advanced qualification in height safety – which has included training in rescuing a person who has fallen or become suspended whilst working at height.

Equipment Operators

(i.e. other operators in the area that may assist such as MEWP, forklift, crane operators)

Equipment operators are personnel specifically trained and designated to use specialist equipment whilst carrying out the rescue plan to recover a suspended person after a fall whilst working at height. Their primary purpose is securing the site and accessing the suspended person.

MEWP operator: Follow instructions of team leader to assist rescue by operating a MEWP to reach up to victim and retrieve, safely lower to ground so that first aid can be administered by the appointed qualified first aider or emergency services.

Emergency Services

(i.e. Fire Emergency NZ, St John, emergency response teams [ERT])

Ambulance/Fire Emergency NZ to take control of situation, rescue faller and administer medical treatment and transport to hospital.

© IMPAC

NOTES

© IMPAC

USEFUL WEBSITES

NEW ZEALAND GOVERNMENT

www.worksafe.govt.nz	WorkSafe NZ
www.standards.govt.nz	Standards New Zealand
www.acc.co.nz	Accident Compensation Corporation
www.fireandemergency.nz	Fire and Emergency New Zealand
www.police.govt.nz	New Zealand Police
www.legislation.govt.nz	New Zealand Legislation
www.getthru.govt.nz	Get Thru Emergency Management
www.civildefence.govt.nz	Ministry of Civil Defence
www.eqc.govt.nz	Earthquake Commission

PRIVATE ORGANISATIONS

www.impac.co.nz	IMPAC Services Ltd
www.safeguard.co.nz	Safeguard Magazine

TRADE UNIONS

www.union.org.nz	New Zealand Council of Trade Unions

KEY POINT

For more useful websites and resources we recommend you login to IMPAC's student portal.

© IMPAC

OTHER IMPAC COURSES YOU MAY BE INTERESTED IN ARE:

PERMIT RECEIVER

This course will allow you to explain the types of work permits, understand the roles of those involved in the work permit system, and the requirements for receiving a work permit.

JOB SAFETY ANALYSIS

Job Safety Analysis involves looking at a task and considering what is the safest way to complete it. This course explains key processes, identifying hazards and controls and how to undertake a job safety analysis for a specified job.

MOBILE ELEVATED WORK PLATFORMS

This course guarantees your comprehension of the pertinent guidelines, regulations, and Codes of Practice necessary for the safe assessment and operation of a MEWP. Additionally, it encompasses a set of hands-on exercises designed for you to apply and evaluate your understanding of hazards, risk

FOR MORE INFORMATION CONTACT US TODAY

contactus@impac.co.nz

0800 246 722

www.impac.co.nz

+IMPAC

© IMPAC

+IMPAC

We trust you enjoyed your training with +IMPAC, New Zealand's leading full service Health + Safety solutions provider.

Health + Safety is our life – it's what we do and we do it all:

RISK MANAGER
:MEXPRESS

Our cloud-based software solutions are designed to provide risk management processes to meet health and safety requirements and keep people safe. Choose between our cost effective, **set-up-and-go solution RM Express** - ideal for small to medium organisations; and **Risk Manager, with its fully customisable range of modules** which can be tailored to the needs of larger organisations.

CONSULTING

We work alongside businesses and organisations to understand their challenges and opportunities. Our hugely experienced consulting team assess, advise, investigate and **deliver relevant and practical solutions**, applying a sensible risk management approach to health and safety.

PREQUAL

Our **pan-industry solution to contractor prequalification** and ongoing management. We cater for both individuals needing contractor prequalification and companies wanting to manage all their contractors in one easy to navigate platform.

VRCOMPETENCY

Our innovative virtual reality programme to quickly and effectively upskill operators of motorised vehicles and machinery in a safe and risk free environment. Our courses accelerate training times, improve and certify skills and offer continuous learning.

TALENTBANK

With our unrivalled industry experience and wide network of talent, our **specialist recruitment service** helps to connect the right H+S people to an organisation's contract or permanent roles. We fully understand our clients' resourcing needs and know the best way to help H+S professionals build a better career.

SAFEWORX

We supply a comprehensive range of quality standards appraised **workwear, personal protection and safety equipment**, online and at retail branches nationwide. Our expert team partner closely with customers to develop innovative safety products to address gaps in high risk industries.

To discuss any of IMPAC's H+S services
contact 0800 246 722

+IMPAC | The Health + Safety Company