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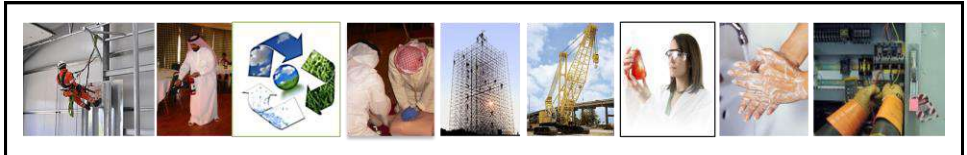


WORKING AT HEIGHTS

COURSE MATERIAL

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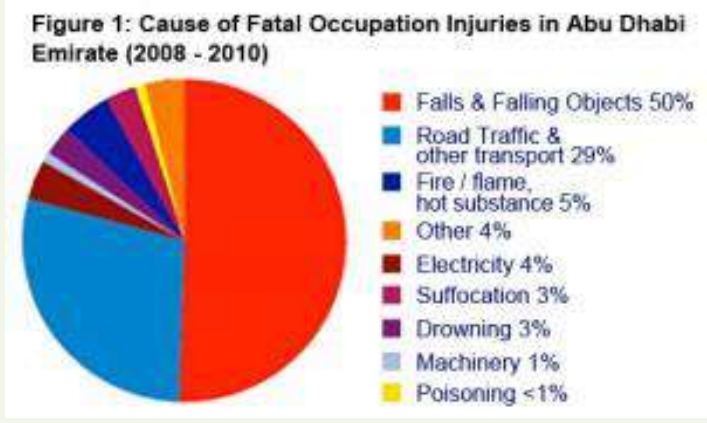
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Training is not a goal, it is part of the solution to a sustained and improved performance

WORKING AT HEIGHT AWARENESS

Work at height statistics



[HAAD Awareness Video](#)

Introduction

Work at height means working in a place where a person could be injured if they fell from one level to another. This can be above or below ground level.

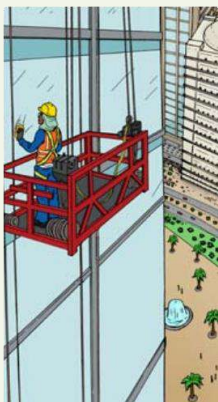
Falls from height are one of the biggest causes of workplace fatalities and major injuries. Common causes are falls from ladders and through fragile roofs.

Work at height does not include slipping, tripping or falling at the same level.

What is Working at Heights?

definitiOn Of WOWorking at HeighTs

WORKING AT HEIGHT MEANS: WORKING IN ANY PLACE WHERE, IF PRECAUTIONS ARE NOT TAKEN, A PERSON COULD FALL AND INJURE THEMSELVES. THIS INCLUDES PLACES Above, At OR below ground level.



working above ground level



working at/below ground level



working at a low height



working at a low height

⚠ remember: you don't have to fall from a great height to be hurt.

For example you are working at height if you:

- are working on a ladder or a flat roof;
- could fall through a fragile surface;
- could fall into an opening in a floor or a hole in the ground.

Take a sensible approach when considering precautions for work at height. There may be some low-risk situations where common sense tells you no particular precautions are necessary



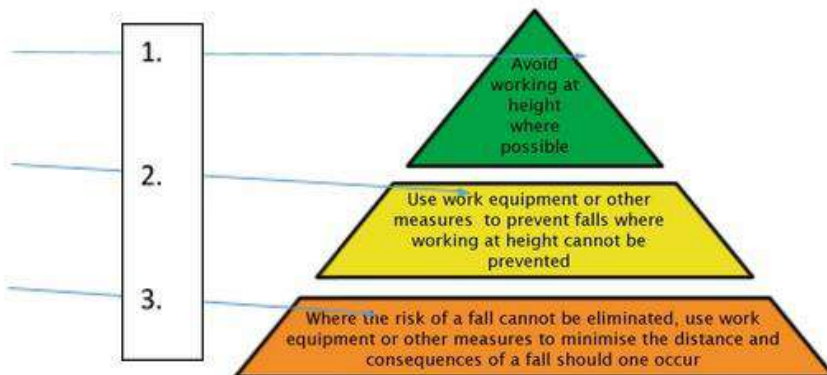
Factors contributing to injuries sustained from working at height include:

- » lack of or inadequate planning and hazard assessment
- » inadequate supervision
- » insufficient training for the task being carried out
- » incorrect protection or equipment choices
- » incorrect use or set-up of equipment including personal protective equipment
- » unwillingness to change the way a task is carried out when a safer alternative is identified
- » suitable equipment being unavailable.

Hierarchy of controls when working at height:

1. Can the job can be done without exposing persons to the hazard (**eliminate**).Can often be achieved at the design and construction.
2. If elimination is not practicable then steps should be taken to **isolate (prevent falls)** people from the hazard.
This can be achieved using safe working platforms, guardrail systems, edge protection, scaffolding, and barriers to restrict access.
3. If neither elimination nor isolation are practicable then steps should be taken to **minimise** the likelihood of any harm resulting. This means considering the use of work positioning systems or travel restraint systems, safety harnesses, and soft landing systems.

working at height Hierarchy of controls



Short duration height work

Short duration work at height shall be treated the same way as any other activity at height.

Appropriate fall prevention controls shall be put in place, regardless of the time duration of the task.

Short duration work means work that lasts minutes rather than hours. It may not be reasonably practicable to provide full edge protection for short duration work but it still needs to be considered during the assessment of hazards and should not be discounted.

Employer Responsibility

- Ensure all work at height is planned, assessed, organised and supervised
- Take account of weather conditions
- All involved in work at height are competent
- The place where work at height is done is safe
- Equipment is appropriately inspected
- The risk of fragile surface is controlled
- The risk of falling objects are controlled



Employee Responsibility

- Report any activity or defect causing a risk to people working at height
- Use appropriate equipment or safety devices provided by the employer in accordance with any training or instruction received in the use of the work equipment.



Preventing Injuries from Falling Objects

- Establish exclusion zone.
- Stop the work when anybody traverse the zone.
- Place warning signs
- Use tool carriers to carry small items
- Wear proper PPE (helmet).
- Install toe board to prevent falling objects
- Secure equipment and tools by lanyards.



Work Plan and Assessment

Too many falls from height are caused by a failure to plan and organize work properly. Start by planning a safe approach.

Planning and assessment safe working at height means:

- » *identifying the hazards*
- » *assessing the hazards*
- » *controlling the hazards*
- » *monitoring your approach*
- » *documenting your approach.*



Identify the Hazards

Identify any hazards of working at height where someone could fall. Four ways of identifying hazards are:

- 1. Physical inspections**—walk around the workplace using a checklist to identify and manage hazards.
- 2. Task analysis**—identify the hazards involved in each task of the job.
- 3. Process analysis**—identify hazards at each stage of the production or service delivery process.
- 4. Analysis of accident investigation**—identify hazards and causal factors from investigations involving similar types of work.



Assess the hazards

Decide if the identified hazards are significant.

How badly harmed someone would be if they fell and how likely a fall could be?

If serious harm could result, then it's a significant hazard.



Control the Hazard

Select the best work method to **Eliminate, Isolate or Minimise** the potential for harm resulting from the significant hazard.

Can the hazard of working at height be **eliminated**?

- Could long-handled tools be used from ground level?
- Could structures be built at ground level and lifted into position on completion?

Can the hazard of working at height be **isolated**?

- Could edge protection be used?
- Could a guard-railed work platform (eg, scaffold or elevating work platforms) be used?

— Could a total restraint system be used to prevent a fall occurring?

Can the distance and impact of the fall be **minimised**? Only take this step when elimination and isolation options have been exhausted.

- Could a fall arrest system be used?
- Could nets or air bags be used to minimise the impact of a fall?

Group controls versus personal controls

The controls that protect multiple people from falling are **group controls**. The best work methods are those that don't require any active judgment by the workers to keep themselves safe, such as edge protection, scaffold, and elevating work platforms.

Personal controls only look after individuals and rely on active judgement by the user for them to work safely (eg, fall restraint harness and fall arrest).

Training, inspection and equipment maintenance are critical for these personal control measures to be effective.



How to select the right equipment?

It is practical to consider the following:

» **Working conditions:**

Slopes, poor ground, obstructions and traffic. For example, an elevating work platform (EWP) could reach over bad ground or obstructions as long as its stability was not compromised.

» **Distance to be negotiated for access and egress:**

Ladders are likely to be less suitable for higher access.

» **Distance and consequences of a fall:**

A fall arrest system would be ineffective if the deployment length was greater than the fall height. The user would hit the floor before the system could deploy.

» **Duration and frequency of use:**

Long-duration, higher frequency work justifies a higher standard of fall protection, eg, a tower scaffold rather than a ladder.

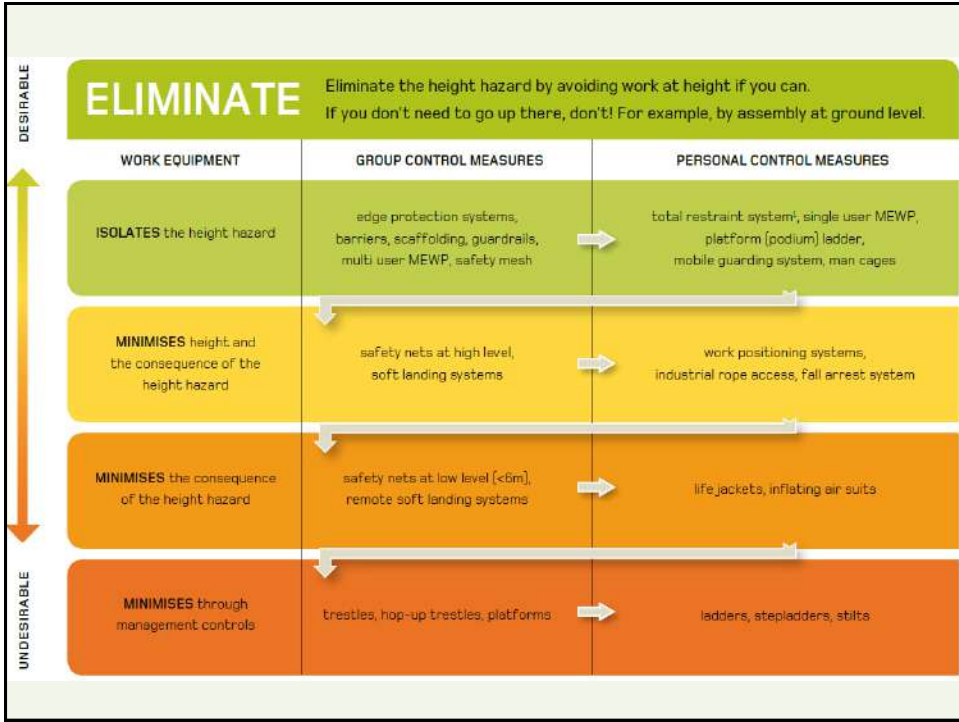
» **Rescue:**

If rescue from a deployed fall arrest system is going to be difficult, choose other work equipment, eg, an EWP.



Monitoring the Approach to Working at Height Safely

The approach should be constantly assessed to ensure it is effective and fit for purpose. This could mean carrying out regular inspections of the control measures, discussing the control measures at tool box talks and site meetings with contractors, and actively supervising the work.



Preventing the risks of working at heights

Hierarchy Of cOntrols

THE Hierarchy of controls SHOULD BE FOLLOWED TO PREVENT ACCIDENTS WHEN WORKING AT HEIGHTS.

- 1**



elimination
Don't do a job at height if you can do it on the ground.
- 2**



substitution
Substitute all defective or dangerous equipment with new or safer equipment.
- 3**



engineering controls, isolation
Try to design out risks and eliminate them altogether.
- 4**



administrative controls
Use signs and exclusion zones to keep people out of dangerous areas.
- 5**



personal protective equipment (ppe)
Safety harnesses should be in good condition and be used by trained workers.

avOid

first priority is always to **eliminate the hazard or risk completely**, avoiding the need to work at height altogether.

prevent

Secondly try to **prevent the fall** by implementing the hierarchy of controls and the appropriate preventive measures.

minimise the distance and consequences

Lastly put measures in place such as scaffolding, equipment or other means to **reduce the distance and the consequences of a fall**.

perSOmal prOjective eQuipment

Personal protective equipment would be the **last resort** since it means the wearer is exposed to the full hazard if not used or not used correctly. **so always use the Avoid, Prevent and minimise measures first.**

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Elimination Controls for Height Hazards

The best method of hazard control is eliminating the potential of a fall.

Consideration of elimination controls should occur early in the project development stage in order to allow necessary design, planning and coordination.


Eliminating the potential of a fall can be achieved through:

- » safer design
- » using alternative construction methods
- » using specific tools and equipment.

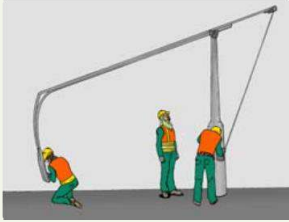
1. eliminatiOn

IF POSSIBLE ELIMINATE THE NEED TO WORK AT HEIGHT BY BRINGING THE JOB OR WORK DOWN TO GROUND LEVEL OR BY EXTENDING THE REACH OF THE WORKER USING LONG-HANDLED TOOLS.

! remember: don't do the job at height if you can do it on the ground




using long-handled tools instead of a ladder




lowering streetlamp for repair

examples

- Design and fit systems that prevent working at heights such as streetlights that come down to the ground for maintenance and cleaning.
- long-handled tools or other equipment can be used to carry out a task from a safe position e.g. long-handled brush or roller for painting.
- store materials at ground or lower levels so that it is within reach of a person without them having to use any aids.



storing materials within easy reach eliminates the danger of height




Preventing the risks of working at heights

2. SuBStitutiOn


SUBSTITUTE THE DEFECTIVE OR DANGEROUS EQUIPMENT WITH NEW OR SAFER EQUIPMENT.

examples

- Substitute any walking platform without handrails with one with **handrails and toeboards**.
- Substitute a defective cradle with one that **doesn't have rust and damage**.
- Substitute a worker who has a fear of working at heights with someone who is **confident, trained** and has no problem working at heights.



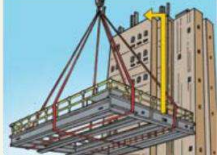
cradle in a bad condition



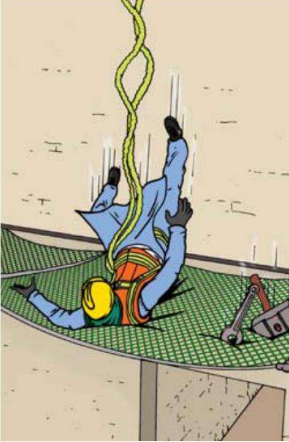
replace with a new and safer cradle

3. engineering cOntrOIS

A LOT OF THE RISK INVOLVED IN WORKING AT HEIGHTS CAN BE DESIGNED OUT. OFTEN YOU CAN MAKE STRUCTURAL CHANGES TO THE WORK SYSTEMS OR WORK ENVIRONMENT THAT WOULD PREVENT FALLS AND MAKE FOR A SAFER WORKPLACE.



Install guardrails before erecting a structure



catch nets and debris netting catch falling objects or people


examples

- Use places that are already safe e.g. places that have **permanent guardrails** or a **correctly designed and built scaffold**.
- Put on edge protection, guardrails and screens **before** erecting a structure.
- **reduce the number** of personnel that have to go near the edge and the number of **times** they have to go.
- Put up **debris netting** to catch any falling objects.

Preventing the risks of working at heights

4. administrative cOntrols

ADMINISTRATIVE PROCEDURES LIKE WORK PERMITS, STANDARD OPERATING PROCEDURES AND SAFETY POLICIES SHOULD BE FOLLOWED TO MANAGE AND CREATE AWARENESS OF THE RISKS OF WORKING AT HEIGHTS. TRAINING, INSTRUCTION AND SUPERVISION ARE ESSENTIAL.



An exclusion zone is used to keep people out of dangerous areas

5. perSonal prOteCtiveEqUipment (ppe)

WORKERS MUST BE PROVIDED WITH CORRECTLY FITTED AND PROPERLY MAINTAINED PROTECTIVE EQUIPMENT AND CLOTHING.

exampleS


- Create an **exclusion zone** to restrict access to areas where there is work taking place above.
- Put up **clear signage** to warn people of fall areas, open pits and unsafe conditions.
- Give employees **information and training** on the standard procedures and safety policies.
- Regularly undertake and record **maintenance, inspection and testing** of systems and equipment to ensure it is suitable as well as sufficient.

exampleS

- **footwear** that is suitable to prevent slips.
- **sunglasses** to make sure that an employee at height is not at risk due to glare or reflection.
- **safety helmets** that will remain in place in the event of a fall.

They must also be **trained** in the **use and inspection** of all personal protective equipment.

! remember: personal protective equipment should be used as a last resort. other control measures should be used first in order to eliminate the need for harnesses.




train workers on the proper use of equipment

exampleS

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train workers on the proper use of equipment

Preventing the risks of working at heights

Safer Design:

Examples of safer design include:

- » use of low-maintenance building materials.
- » locating air conditioning and similar plant at ground level
- » installing walkways with handrails
- » having permanent guardrails or other forms of edge protection, for example parapet walls.



Using Alternative Construction Methods:

Examples of alternative construction methods include:

- » prefabricating wall frames horizontally before standing them up
- » prefabricating structures on the ground or before installation and lifting them into position.
- » pre-painting fixtures/roofs before installation
- » installing and maintaining antennae and satellite dishes or air conditioning in areas other than at height.

Isolation and Minimisation Controls for Height Hazards

Examples of group controls are:

- » scaffolding
- » edge protection
- » mechanical access plant
- » safety mesh.

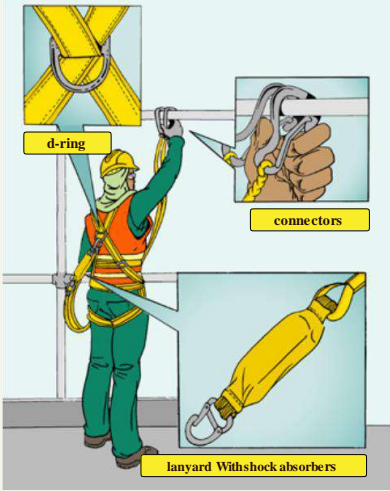
Controls such as harness systems and temporary work platforms provide a lesser form of protection, and should only be considered when group controls are not practicable.

Mandatory PPE While Work at Height

- Helmets may need to include a chin strap.
- Eye protection should be compatible with the helmet and also spectacles, if worn.
- Footwear is to provide firm support to the foot and ankle and so should have a well defined instep and patterned sole to prevent slipping
- Protective gloves, when appropriate, should not compromise dexterity and must be suitable for the prevailing weather conditions.

Safety HarneSS SyStem

A SAFETY HARNESS MUST ONLY BE USED IF THERE ARE NO OTHER REASONABLE OR PRACTICAL OPTIONS THAT WOULD PROVIDE ADEQUATE FALL PROTECTION.



d-ring

connectors

lanyard With shock absorbers

a Safety HarneSS SyStem cOn-SiStS Of tHe fOllOWing partS tHat muSt Be in gOOd cOnditiOn:

Safety HarneSS

- Full-body type with **fall arrest attachment**
- Must provide the maximum degree of **comfort** and **freedom of movement**

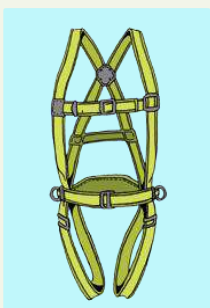
lanyardS
(connect the harness to the anchor point)

- A **flexible line** of rope or strap with **shock absorbers**

cOnnectOrS (attach the harness to the rest of the fall arrest system)

- Must have **self-closing, self-locking gates** opened by at least two consecutive deliberate actions.
- The **d-ring** located high in the centre of the back is the appropriate connection point for **fall arrest** purposes. There can also be other D-rings used for positioning, restraint and rescue.

- There must be a **detailed rescue plan** in place if safety harnesses are going to be used.
- The equipment must be **regularly inspected** and **maintained**.
- It must be **checked before use**.



safety harness

ancHO r pOintS

Warning: harness systems can only be used if there are secure anchor points in suitable positions, the Worker's harness needs to be attached to an anchor point via a single or double lanyard and connector.

- Before workers move into an unsafe position they have to be attached to a **secure anchor point**.
- The anchor point must be **independent of any platform anchorage**, capable of supporting the worker and not used to anchor anything else.
- The position of the anchor point will determine how far the person will fall (**the fall factor**).
- Best practice is to have the anchor point **as high as possible** (above the head) to reduce the fall distance.
- Good practice is to have the anchor point at the same **level** as the **back attachment point** where the harness attaches.

Anchor point high, worker doesn't fall far.

Anchor point low, worker falls far.

Safety harness system

Scaffolding

Scaffolds are a common way to provide a safe work platform. There are a wide variety of scaffolding systems available.

All scaffolds should be erected, altered and dismantled by **competent** persons who have been trained and have suitable experience with the type of scaffolding being used.

Where a scaffold is used as a means of protecting people working on a roof, it is preferred that the scaffold is set up in a manner that prevents a fall from occurring, regardless of the distance of the fall.



All scaffolds shall be supplied with adequate information for the scaffold user, such as a scaffold tag or handover certificate.

The information supplied shall include:

- » its intended use.
- » safe working load.
- » dates of inspections (as applicable—the scaffold provider can advise the frequency of these dates).
- » manufacturer's instructions for assembly.
- » any special conditions and limitations.

Edge protection

Edge protection is used to prevent persons, objects or materials from falling. Areas where the likelihood of a fall exists and edge protection should be used include:

- » perimeters of working places.
- » openings
- » where there is brittle material that cannot safely support the weight of a person.

Edge protection may be temporary, for example during the course of construction.

It may also be used in completed buildings, for example a permanent balustrade preventing a fall from a mezzanine floor.



Example of edge protection on a roof of a residential home.

Edge protection may involve:

- » a proprietary (engineered) system.
- » materials to form a guardrail and/or physical barriers.
- » erected scaffolding that supports a temporary edge-protection system.
- » a combination of solutions.

Every open-side floor or platform 2 meters and above shall be guarded by standard railing on all open sides

A standard railing shall consist of top rail, mid-rail and posts. And shall have a vertical height of 950mm

Every flight of stairs having four or more risers shall be equipped with standard stair railing or standard hand rails.

Integrity of the edge protection

Ensure edge protection is:

- » erected, used and maintained in accordance with its design information.
- » regularly inspected by a competent person.
- » inspected after a storm or other occurrence that could affect its purpose to prevent falls.
- » free of any defects before use.

Erecting edge protection

- Persons erecting edge protection could potentially be exposed to the hazard of working at height until the installation is completed.
- Pre-planning, such as a task analysis and a hazard analysis, will identify the hazards involved and which controls can be implemented to prevent harm during the erection process.
- Installation workers must have hazard controls in place.



Objects falling from Heights

ITEMS SUCH AS TOOLS, EQUIPMENT AND MATERIALS FALLING FROM HEIGHTS ONTO PEOPLE ARE JUST AS DANGEROUS AS FALLS AND LEAD TO FATALITIES. FROM HIGH UP, EVEN A SMALL PIECE OF CONCRETE OR A SINGLE BOLT OR SPANNER CAN SERIOUSLY HURT OR KILL SOMEONE.

An untidy factory walkway increases the risk of falling objects

A tidy walkway means easy access in and out

Common factors leading to incidents and injuries from falling objects:

- Work surfaces cluttered and material not secured
risk: being blown off by the wind
- Tools/equipment not secured with lanyards
risk: being dropped or kicked off
- No toeboards or 'kicker plates' on walkways and edges
risk: items being kicked or rolling off the edge
- No netting
risk: no catchment or barrier for falling objects
- Workers not trained in rescue of fall victims
risk: Permanent injury or more people being injured
- Workers not wearing hard hats in high risk areas
risk: Injury by falling objects

Risks of working at heights

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danger from above...
 upabove someone is painting, there is no exclusion zone or signs Warning of Work being done upabove.

a Worker Walks by Without a hard hat.

the painter knocks over the bucket and there is no edge protection to prevent it falling...

...right onto the Worker Walking below.

he ends up in hospital With serious injuries.

this is how it should be done: there is an exclusion zone With a correct Warning sign, there is edge protection, and the Worker is Wearing his hard hat.

risks of working At heights

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external factors

EXTERNAL FACTORS SUCH AS WIND, HEAT STRESS, STRUCTURAL INSTABILITY AND WORKER FACTORS SHOULD ALL BE CONSIDERED ALONG WITH CONTROL REQUIREMENTS AS THEY CAN BE THE CAUSE OF FALLS LEADING TO INJURY.

blowing sand causes poor visibility

wind can blow materials or workers off

heat stress can cause falls

One of the most important environmental factors when working at heights is wind.

- wind usually gets stronger the higher up you go.
- Semi-constructed buildings can create potentially dangerous funnelling effects.
- Wind can blow off materials and even workers.

Other external factors that should be considered and included in a safe system of work are:

- heat stress and dehydration of workers working at heights.
- dust and blowing sand – causes poor visibility and instability.
- building movement.
- vertigo – dizziness and feelings of instability when working at heights.

risks of working At heights

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Guardrails

Guardrails are a group control that can be installed to protect workers from building edges, roof edges, building openings, lift shafts and other similar ducts with wall or floor openings.

A guardrail must be constructed to withstand the forces that are likely to be applied to it .

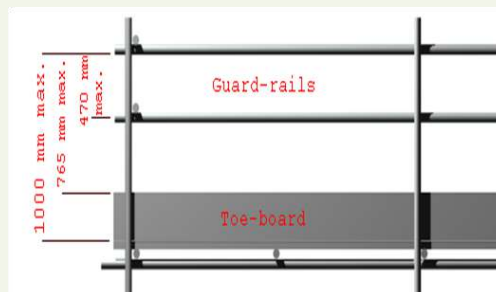
Temporary guardrails should generally be constructed using a proprietary metal tube and clip system.

Guardrail systems that are installed to protect an edge of a sloping roof surface have specific design requirements.

Guardrails

A guardrail shall be provided where there is a fall potential of 2 meters or more.

Where less than 2 meters, risk assessment to be conducted to decide on the control, but as a minimum requirement a single guardrail 950mm should be provided.



Work inside of shafts should, when practicable, be undertaken from a fully decked working platform; if this is not practicable, a harness system shall be used.

Protect people and objects from falling by:

Guardrail shall be provided a minimum of 950mm above working platform

Toe boards shall be provided at least 150mm high and run along the edge.

Mid-rails shall be installed where the risk of falling 2 meters and above.

Screen and mesh shall extend from the guard rail to the working level.

Mid-rails to be installed to prevent opening more than 470mm at any structure

Barriers to restrict access (also known as bump rails).

Barriers should be used to cordon off elevated areas including roofs, balconies and open excavations where edge protection is not provided and people are not permitted access.

The barriers should be secure and with access restricted to authorised people only.

Signs should warn against entry to a cordoned-off area.

Barriers should be placed at least **2 metres** in from any unprotected edge or opening.

They should be highly visible and capable of remaining in place during adverse weather conditions.

Mobile Tower Scaffold - Precautions

- Guardrails
- Not overloaded
- Wheels locked
- Firm, level ground
- People, materials off mobile tower when moved
- Avoid overheads
- Outriggers used
- No climbing outside of tower
- Training
- Max Height?



Video 1

Video 2

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Mechanical access plant

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 plant include:

- » mobile elevating work platforms
- » forklift platforms
- » crane lift platforms
- » vehicle extension arms
- » knuckle boom.

These 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, and the operator should be competent and operate it within the manufacturer's guidelines.

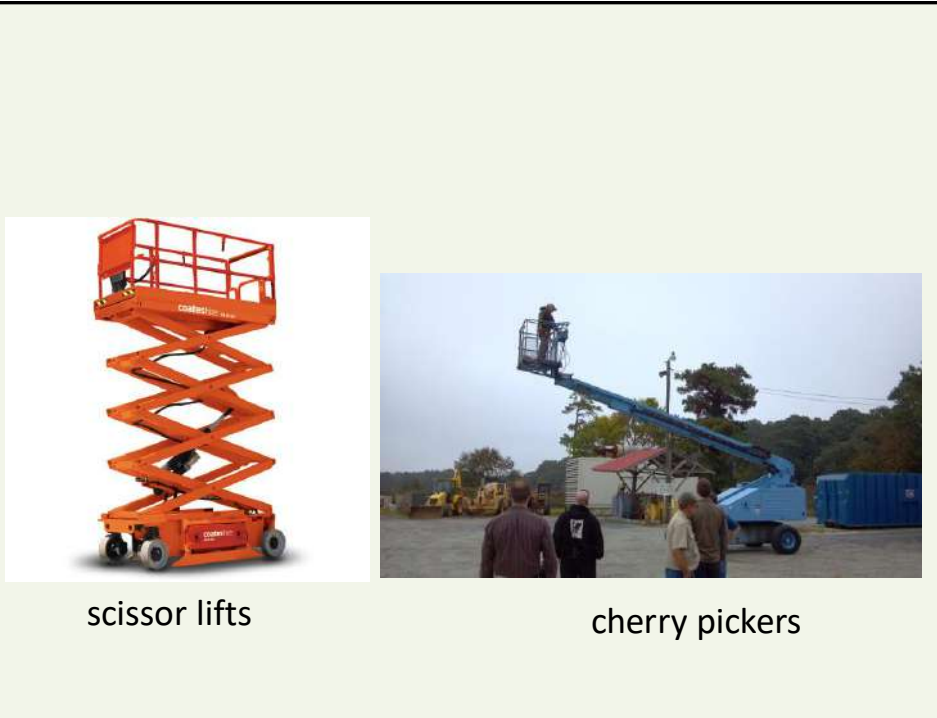
Mobile Elevating Work Platforms (MEWPs)

Common forms of MEWPs include cherry pickers, scissor lifts, hoists and travel towers.

Mobile elevating work platforms:

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

An operator in a boom-style MEWP shall wear a safety harness with a lanyard incorporating a short energy absorber attached to a certified anchor point. The line should be just long enough to provide free movement within the confines of the bucket.



scissor lifts

cherry pickers

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, eg, the boom will not swing out into the path of other vehicles.
- » the MEWP will not be overloaded or used as a crane. (As an estimate, a person plus light tools is deemed to weigh 100 kg.)

- Operators should not over-reach or climb over the rails of the MEWP platform. The soles of both feet should be kept on the work platform.
- Scissor lifts and other elevating work platforms such as cherry pickers can be used as a means of access to a work area. In this case, the worker should be protected by a **double lanyard** system fixed to a certified anchor point.
- On a scissor lift a harness should be worn.
- The manufacturer's instructions should also be followed.

Weather Conditions

Safe work on MEWP during inclement weather to be considered such as rain snow fog etc

Max Allowable Wind Speed to Work=20knots/23mph/37kmph



Crane Lift Platforms

Where no other practical and suitable method is available as a last resort (except when conventional means such as a ladder, stairway, aerial lift, elevating work platform, or scaffold would be more hazardous or impossible because of structural design or worksite conditions) a working platform may be suspended from a crane and the **worker must be attached to the hook**.

The crane operator and the person using the platform should maintain direct communication by line of sight or by telecommunication at all times.



Knuckle Booms

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.



Harness Systems

A 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 workface where there is a risk of a fall. The most common harness systems include:

- » total restraint systems
- » fall arrest systems
- » work positioning systems
- » industrial rope access systems
- » safety lines, lifelines, prescribed or proprietary (engineered) systems.

Overhead Crane

[Importance of Lifeline Video](#)

Total restraint system

The preferred harness system for working at height is the **total restraint system** (sometimes referred to as a travel restraint system). This system protects a user from approaching an unprotected edge, thereby preventing a free fall from occurring. The system consists of equipment rated for a fall—such as a full body harness that is connected by a lanyard or safety line to a suitable anchorage point or horizontal lifeline.



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**.

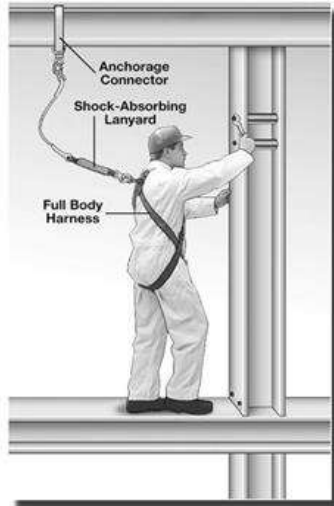
Fall arrest is a minimisation measure as it does not prevent the fall from occurring. These systems require a higher level of operator competency and supervision.

FAS consist of a harness which is connected to an anchorage point by means of a lanyard incorporating an **energy absorber**.

When fall arrest systems are used an appropriate **safety helmet** shall be worn to protect from head injury during an uncontrolled fall.

- ❖ Fall arrest Devices to be inspected and certified every 6 months by third party company.
- ❖ Inspection include anchorage points and lifelines every 12 months

Personal Fall Arrest Systems



Personal Fall Arrest Systems consist of:

- Anchorage Connector
- Shock Absorbing Lanyard
- Full Body Harness

Work positioning systems

Work positioning systems enable a person to work supported in a harness under tension in a way that a fall is prevented.

Generally the arrangement allows for the worker to maintain a stable position and to work hands-free while completing a task.

The harness arrangement should not allow a fall of more than 600 mm. This is generally achieved through the use of short lanyards of 300 mm.

Work Positioning

- Positioning device system means a body built or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.
- Work Positioning free fall cannot exceed 24 inches.
- Max fall arrest force is 900 lbs.
- Lanyards and harnesses used.
- Equipment must have minimum breaking strength of
- 5,000 lbs.



A positioning-device system with self-retracting lifeline

Anchorage

Permanent anchors A permanent anchor point should be designed by a chartered professional engineer, so that its installation, testing and maintenance can be tracked during its lifetime.

Permanent anchor systems are exposed to environmental and other working stressors during their lives. They are also reliant on the condition and strength of the material they are installed into. Therefore, anchor testing and inspection regimes should consider all these factors.

The expected design life of the anchor and the required maintenance should be specified by the designer.

Strength=5000lbs/2300kg



Anchorage

Temporary anchorage: A temporary anchor can include proprietary fittings or an appropriate arrangement of strops and ropes.

All temporary anchors shall be set up by a **competent** person. It shall be installed in accordance with the manufacturer's 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.

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



Training

All harness work requires training and competence and only trained and competent personnel can install and use harness systems on site.

Persons not trained should be inducted by the system installer or other qualified persons before they are permitted to use the system.

They should also be supervised at all times by another person who is also trained and competent.



Minimising the potential fall distance

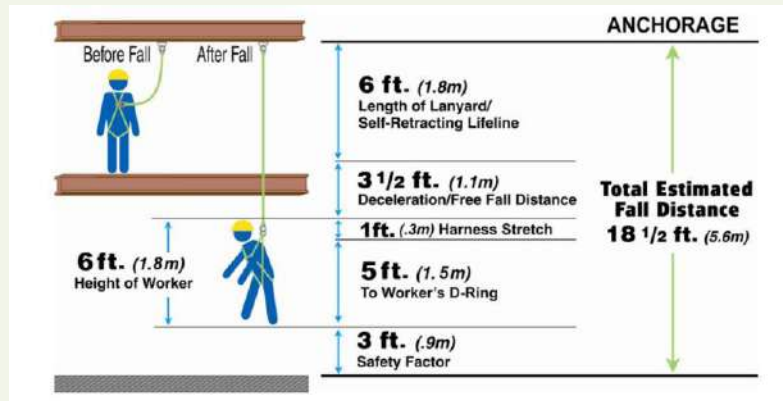
When a fall arrest system is being used, the potential free-fall distance should be less than two metres. Energy-absorbing lanyards should not be used in conjunction with inertia reels as this can result in an excessive distance of fall prior to the fall being arrested.

There should be sufficient distance between the work surface and any surface below to enable the system, including the action of any shock absorber, to deploy fully.



inertia reels

Minimum Clearance



Required minimum clearance below the level of the line anchorages.

Maintain Minimum of Slack in Fall Arrest Line

There should not be excessive slack in the fall arrest line between the user and the attachment. The anchorage point should be as high as the equipment allows. Never work above the anchor point, as this will increase the free-fall distance in the event of a fall, resulting in higher forces on the body and greater likelihood of the arrest line snagging on obstructions.

Positioning the inertia reel anchor points

Inertia reels should be anchored above head height to prevent the line making contact with an obstruction and to limit the free-fall distance to that recommended by the designer/manufacturer.

The user should work within an arc of up to 30 degrees below the inertia reel unless otherwise specified by the manufacturer.

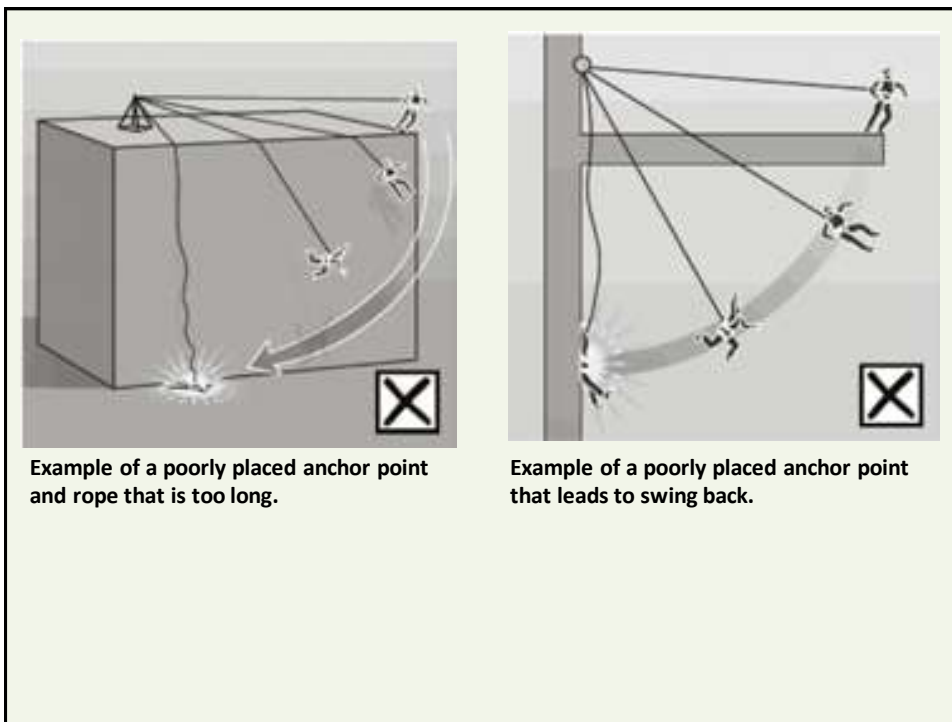
Pendulum effect

The pendulum effect is a potential hazard with the use of harness systems. It can occur in two situations, swing down and swing back.

To prevent the pendulum effect from occurring:

- » place the anchorage point at a right angle to the position of the line at the perimeter edge; a mobile anchorage is of assistance here
- » use secondary anchor points and/or anchor lines.
- » use a perimeter guardrail to prevent any fall over the perimeter edge.

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



Rescue planning

A rescue plan should be developed before installing the harness system. A worker suspended in a harness can develop suspension intolerance. This is a condition in which blood pooling in the legs can lead to loss of consciousness, renal failure and, in extreme cases, death.

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

A rescue plan should consider:

- » the rescue method, ie, use of a crane or elevating work platform.
- » available equipment.
- » responsibilities and training.
- » communication.
- » medical requirements.
- » involving the emergency service.

Workers using fall arrest systems must never work alone.

Temporary work platforms (TWP)

Temporary work platforms should be constructed by a competent person and should be suitable for carrying out specific work that is most often under five metres in height.

They are either:

- » a proprietary (engineered) work platform constructed and used in accordance with the manufacturer's instructions, or
- » a constructed work platform using construction materials and built by a competent person.



a worker uses a step platform with barriers on all sides.

Scaffold temporary work platforms

The most common example is scaffolding—proprietary and tube and clip. Guardrails, including mid rails and toe boards, should be provided on the exposed sides and end of all working platforms regardless of height.



Non-scaffold Temporary Work Platforms

A variety of non-scaffold temporary work platforms are available, some with guardrail protection and some without.

Where the work platform does not have any guardrail system it should be restricted to low-level use, for example, a hop-up platform or a step platform on a stepladder.

The platform should be sufficient in area for the users to undertake their work safely.



Folding platform (with no edge protection).



Folding platform (with guardrail).



Podium platform with guardrail on three sides.



Folding platform (with handrail).

Trestle Scaffolds

Trestle scaffolds are only suitable for low-level work because of the difficulty of incorporating a guardrail system.

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 hazard assessment also must show that other alternative controls that give more protection cannot be used.

Podium, folding, and step-up platforms

Podium, folding or step-up platforms and platforms with no edge protection are generally intended for short-term interior work.



A worker stands on a trestle scaffold.



A hop-up trestle.

Step platforms

A step platform provides a safer alternative to a stepladder, 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.



Step platform.

Soft Landing Systems (SLSs)

The purpose of a SLS is to mitigate the effect of falls from height during construction by providing an energy-absorbing landing area. Most SLSs have been designed for use principally inside a building where the bags will be enclosed by walls or partitions. SLSs do not prevent a fall, but they may minimise the harm from one.



A worker falls into a soft landing system.

Safety Nets

Safety nets are used on construction sites 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. They are lightweight and rot-resistant, but 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. It is therefore 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.



Safety Net

Ladders, Stepladders, and Means of Access

Ladders and step ladders do not offer fall protection and therefore should be the last form of work access equipment to be considered. And 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 and stepladders should be of trade or industrial standard and be rated at not less than 120 kg. Ladders should be:

- » clearly labelled as complying with standard.
- » structurally sound.
- » free of defects.
- » not covered in chemicals or other materials.

Issues 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 (navel) 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.



ladders

⚠️ only use ladders for low risk, short duration work. don't work from a ladder for more than 30 min at a time.

ladder use - good practice

- Avoid carrying materials or tools up and down a ladder. Keep **three points of contact** to the ladder as much as possible.
- **don't** set it up **near a passageway**, doorway, or other place where a person, vehicle or load might strike it.
- It must stand on a **level, stable and non-slippery surface**. If the ground is soft or uneven, wide planks can be used as a base.
- It must be **secured** at the **bottom** and the **top** to keep it from slipping or falling back.
- It must be **long enough**. Don't stand on the top three rungs of the ladder.
- Ladders must only be used by **one person** at a time.
- **face** the **climbing side** of the ladder when going up or down.

additional precautions

- Don't use **aluminium** ladders where there are live electrical facilities.
- Don't use ladders near other **fall hazards** such as edges or voids i.e. don't use ladders on **scaffolding** to create extra height.
- Don't use ladders outside in very **windy conditions** or **bad weather**.

keep three points of contact to the ladder as much as possible

don't use aluminium ladders near live wires

don't use ladders in windy conditions

General safety measures

2
3

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 suitable type of access equipment.
- Avoid holding items when climbing ladders and stepladders by using tool belts.



Correct – steps facing work activity.



Incorrect – steps are side-on to work activity.

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 over-reaching.
- » whether the user's feet are fully supported.
- » whether the stepladder can be tied.
- » location, eg, away from driveways and doorways unless isolated.
- » that there is four metres clearance from electricity lines.



Maintain three points of contact climbing the ladder.

Preventing Ladders from Slipping

All practicable steps must be taken to prevent a leaning ladder from slipping or falling.

Where possible:

» tie (or equally effectively secure) the ladder at the top.

If this is not possible tie it where practicable

» use an effective ladder stability device.

» wedge the ladder against a suitable fixed structure, eg, a wall.

» 'foot it' by facing the ladder with both feet on the bottom and both hands on the stiles.



Preventing Ladders from Slipping

The user and footer should not overload the ladder.

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 over-reach 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**.

Ladder Stability Devices (LSDs)

Ladder stability devices are available and may offer additional means of achieving ladder stability where other methods would not work, eg, tying or footing.

Ladder stability devices and ladder levellers should only be used strictly in accordance with the manufacturer's and supplier's instructions for use.



Checking Ladders before Use

The following should be checked before using a ladder and after any incident (eg, ladder being dropped).

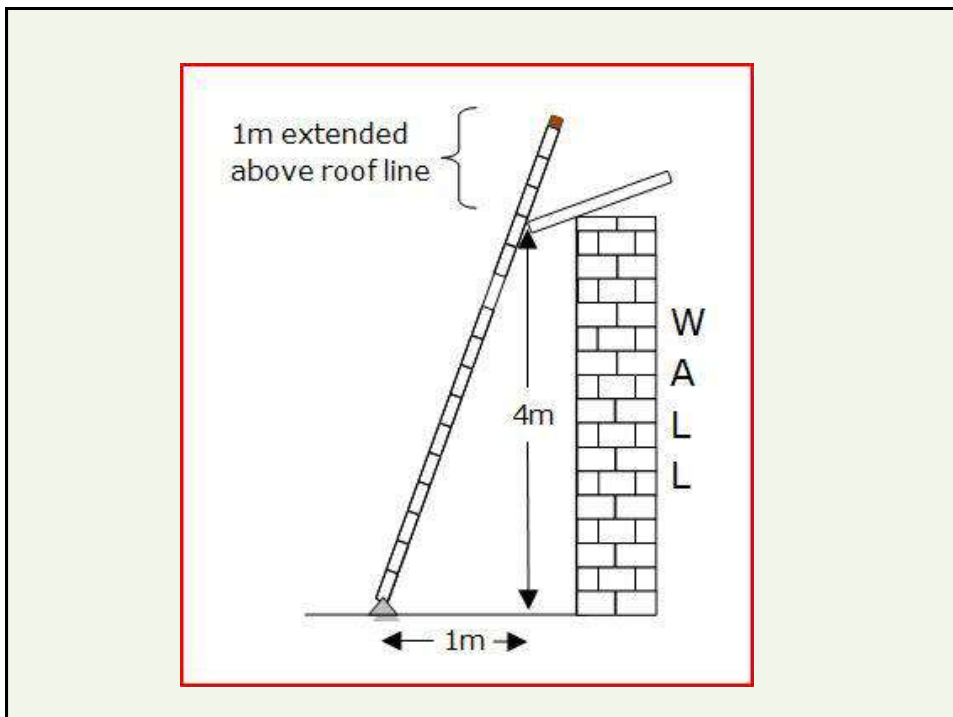
- ›› Check all feet and caps are present and in good condition and securely fastened.
- ›› Ensure all side stays and clips are present and fixed in place.
- ›› All rivets are present and in good condition.
- ›› Rungs have not been bent or damaged.
- ›› Side stiles have no deformities, ie, dents or structural faults.

Access and egress

A single portable ladder set up and secured at a slope of a ratio of 4:1 (four metres up by one metre out) and extending at least one metre or three rungs above the stepping-off point is a suitable means of access and egress, provided it is:

- » a step ladder of maximum length – six metres
- » a single ladder of maximum length – nine metres
- » secured against sliding top and bottom
- » set on firm, level ground
- » extending by one metre higher than the step off point
- » used by no more than one person at a time except when footing.

Climbing a ladder to secure it at the top can be hazardous. It is advisable to have another person to secure the ladder at the bottom while this is achieved.



Job Supervisor

- Shall ensure that work at height jobs are properly planned, risk assessed and supervised (Checklist PTW JSA)
- Shall develop adequate and documented work instruction for routine overhead tasks
- Shall ensure that workers at height are trained competent and possess correct PPE
- Shall include an emergency response and rescue plan during planning and risk assessment of different types of work at heights
- Shall conduct TBT to all workers at height and ensure that everyone is aware of potentially risk involved and control measures.

Other hazards that can impact on working at height

The following is a list of some of the more common issues that should be considered when identifying the hazard of working at height.

Falls From Height

CIRCUMSTANCE

- » Access between multiple levels.
- » Advancing edges of in-situ or precast concrete and steel erection.
- » Edges of roofs.
- » Edges of upper-level floors.
- » Ladders.
- » Mechanical plant: EWPs, crane lift platforms, forklifts.
- » Penetrations, openings or hoist areas.
- » Scaffolding: erection and use.
- » Unprotected shafts and excavations.

Falls From Height

CONTROLS:

ELIMINATE

- » Organise work to be carried out on the ground

ISOLATE

- » Provide stairs
- » Provide guardrails, including mid rails
- » Provide scaffolding
- » Use elevating work platforms
- » Cover or fence penetrations and openings
- » Cover or fence excavations
- » Cover roof areas with safety mesh before roofs are laid

MINIMISE

- » Provide close spacing of roof battens
- » Provide secure ladder access
- » Install safety nets
- » Use restraint (travel restriction) techniques
- » Use work positioning techniques
- » Use fall arrest systems
- » Provide soft landing systems
- » Use protective footwear that provides a non-slip and flexible grip

Electrical Shock and Arc Flash

CIRCUMSTANCE

Working in the proximity of overhead power supply including:

- >> MEWPs
- >> scaffold
- >> ladder work
- >> working above or to the side of power lines.

Caution:

Access using insulated work platforms and insulated tools is specialist work, and may only be carried out by workers who have the required competency to industry standards, and in accordance with approved industry procedures.

Electrical Shock and Arc Flash

CONTROLS:

Eliminate

Have overhead services transferred to underground before commencing work at height.

Isolate

Overhead conductors are disconnected from service by the power supply company and the work area is confirmed to be safe. Obtain written confirmation from the person who disconnected the power to verify which work areas are isolated from power and which areas are not.

Contact the power company to obtain written confirmation of the safe working distance and then plan all work to be conducted from outside of the zone as per the instructions of the power company.

Electrical Shock and Arc Flash

Minimise

Establish a plan that ensures that work can be achieved without likelihood that the minimum approach distances *will be* breached. Only allow work in the vicinity of the live lines if this is achievable. Use a safety observer (this is particularly relevant if MEWPs are used, as the operator may become spatially disoriented and the work involves frequent movement or relocation).

Falls Through Upper Level Surfaces

CIRCUMSTANCE

- » Corroded metal roofing
- » Fragile or brittle surfaces: asbestos cement, cellulose cement, glass, fibreglass, acrylic or other similar moulded or fabricated material
- » Skylights and roof penetrations

CONTROLS:

ISOLATE

- » Use walkways and crawl boards.
- » Cover or guard all brittle and dangerous areas.
- » Work from scaffolding or platforms immediately below brittle surfaces.

Minimise

- » Use mechanical access plant.
- » Use a bump rail or physical barrier to keep all people at least two metres away from brittle areas.
- » Assess roof conditions from below.

Struck by Falling Objects

CIRCUMSTANCE

- » Loads are placed on elevated work areas.
- » Overhead crane/lifting operations.
- » Work is to be carried out above other workers.

CONTROLS:

ISOLATE

- » Fit toe boards or equivalent protection
- » Tether tools and equipment
- » Secure storage of materials
- » Install catch screens or platforms
- » Erect a gantry or a protective screen over high-volume/public areas.
- » Fence off lower areas.

Minimise

- » Provide mobile construction plant with a falling object protective structure (FOPS)
- » Provide warning signage.
- » Provide safety watch person.
- » Wear safety helmets and safety footwear.

Trips and Slips

CIRCUMSTANCE

- » Changing levels.
- » Construction debris material/ poor housekeeping.
- » Crowded or cluttered work area.
- » Electrical leads.
- » Lapped planks.
- » Sloped work surfaces.
- » Surfaces that are wet/icy, polished, glazed or oily

CONTROLS:

ELIMINATE

- » Keep surfaces clean and free of tripping hazards or materials.
- » Keep all work areas tidy and clean, and store materials when not in use.
- » Pull out, screw in, or trim up protruding nails, screws and bolts.

Isolate

- » Isolate any protruding reinforcing steel work.

Minimise

- » Provide adequate work area and good task lighting.
- » Provide non-slip work surfaces.

Manual Handling

CIRCUMSTANCE

Handling materials which may be caught by the wind.

- » Momentary imbalance leading to sudden movement.
- » Work at height creating awkward body position.

CONTROLS:

ELIMINATE

- » Use lifting aids to deliver materials

Isolate

- » Provide an enclosed work area

Minimise

- » Reduce weight and size of objects
- » Keep tool belts balanced and weight down.
- » Position work so it is in a neutral position and over-reaching or excessive holding is not required.

Plant and Machinery Injuries

CIRCUMSTANCE

» Unguarded machinery: conveyors, chain and belt drives

» Vessels and pipes at extreme hot and cold temperature.

» Vessels and pipes leaking hazardous substances.

CONTROLS:

ELIMINATE

- » Disconnect power supply

Isolate

- » Isolate equipment—lock out/tag out

Minimise

- » Install guards.
- » Maintain minimum safe distances from operating machinery.
- » Provide safety watch person.

Environmental Hazards

CIRCUMSTANCE

- » Heat (sun).
- » High winds.
- » Icy conditions.
- » Rain.
- » Reflective glare off surfaces.
- » Wind.

CONTROLS:

ELIMINATE

- » Where necessary cease operations

Isolate

- » Provide work shelters

Minimise

- » Wear protective clothing.
- » Ensure footwear with good grip is worn.
- » Use sun screen.
- » Provide a stable work environment.
- » Provide emergency procedures.
- » Provide adequate fresh drinking water.

Electrocution

CIRCUMSTANCE

- » Electrical plant and machinery.
- » Gantry crane 'buzz bars'.

CONTROLS:

ELIMINATE

- » Disconnect or de-energise electrical supply.

Isolate

- » Isolate electrical supply—lock out/tag out.
- » Install insulating barriers, eg, sleeves, wraps, or tiger tails

Minimise

- » Plan a safe work process.
- » Provide safety observer.

Excavations, Trenches, Openings, and Shafts

CIRCUMSTANCE

- » Cave-ins.
- » Engulfment.
- » Fall through.

CONTROLS:

ELIMINATE

- » Do not work near excavations, openings, or shafts

Isolate

- » Use barriers and keeping safe working distance
- » securely cover

Minimise



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