Safety, Health and Environment National Authority

# INDUSTRY GUIDANCE NOTE

| TOPIC: GUIDANCE TO WORK AT HEIGHT AND WORKING AT HEIGHT RESCUE PLAN | | | Reference Number: 2021/IGN/07 |
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# SECTION A: GENERAL REQUIREMENTS

## 1. INTRODUCTION

### 1.1 PURPOSE

The purpose of this document is to describe the hazards from working at height and describe the controls that must be in place when working at height. The scope shall apply to all work at height activities across all industry sectors.

This guidance has been prepared to enhance the standard of work at height safety at workplaces and manage work at height activities through:

(a) Risk management framework;
(b) Development and implementation of a Fall Prevention Plan;

Falls from height (FFH) is the largest cause of death at workplaces in recent years. Therefore, it is essential that measures are taken to protect workers.

The role of the management is crucial in ensuring the success of any safety programme. A committed management leading by example to promote safety at the workplace will drive the rest of the organisation to behave similarly. Over time, the safety culture in the workplace will evolve so that every person takes it as his responsibility to ensure a safe and healthy workplace.

It is also very important for persons who are working at height to be competently trained in the work to be done, aware of the risks involved and follow the required safe work procedures which include the use of proper personal protective equipment.

This guidance provides measures that can be implemented to help eliminate or reduce the risk of falling from height as well as measures to be taken to promptly rescue suspended persons from height.

### 1.2 APPLICABLE LAW

- Workplace Safety and Health Order, 2009
- Workplace Safety and Health (Construction) Regulations, 2014
- Workplace Safety and Health (General Provisions) Regulations, 2014
- Workplace Safety and Health (Risk Management) Regulations, 2014

### 1.3 REFERENCES

- HSE-27-MOD HSE Manual – Work at Height
- Code of Practice for Working Safely at Heights, Second Revision, 2013, Workplace Safety and Health Council, Singapore
- Technical Advisory for Working at Height, Workplace Safety and Health Council, Singapore
- HSE27 Work at Height, Ministry of Development HSE manual
- Evidence-based review of the current guidance on first-aid measures for suspension trauma, Health and Safety Executive UK.

- Health and Safety Laboratory and the University of Birmingham for the Health and Safety Executive 2009.
- Pictures courtesy of local training provider for work at height and rescue

## 2. FALL PROTECTION PLAN

### 2.1 PRINCIPLES OF A FALL PREVENTION PLAN

(a) A fall prevention plan is a documented site-specific plan prepared for the purpose of reducing or eliminating risk of falls.

(b) The fall prevention plan may consist in parts of existing documentation (e.g. risk assessment). Workplace required to have a safety and health management system may use the required documents to constitute a fall prevention plan. Such documents should fulfil the following:
- Address fall from heights hazards comprehensively;
- Relevant to the specific factory/workplace/ work site covered in the fall prevention plan; and
- Readily available at the factory/workplace/ work site covered in the fall prevention plan.

(c) The fall prevention plan has to:
- Establish clear individual responsibilities for fall prevention at work sites;
- Integrate fall prevention into worksites' Safety and Health Management System for enhancement and sustenance of work at heights safety;
- Provide a systematic approach for eliminating or reducing risk of falling from heights;
- Ensure that all reasonable fall prevention and protection measures and methods have been taken prior to commencement of working at heights; and
- Ensure the adoption of a holistic approach to fall prevention and work at heights safety.

(d) The fall prevention plan is to be developed by a competent person. Provisions must also be made for adequate supervision to ensure that the plan is being implemented at the workplace.

(e) The fall prevention plan shall be monitored and reviewed periodically to ensure its relevance and effectiveness. It must also be properly documented and kept readily available at the workplace.

### 2.2 FALL PREVENTION PLAN COVERAGE

The fall prevention plan should be customised to address the unique conditions at individual workplaces.

### 2.3 FALL PREVENTION PLAN COMPONENT LIST

A comprehensive fall prevention plan should include (but not be limited to) the following components:

a) Policy for fall prevention;
b) Responsibilities;
c) Risk management;
d) Risk control measures;
e) Procedures;
f) Use of personal protection equipment (PPE);
g) Inspection and maintenance;

h) Training;
i) Incident investigations; and
j) Emergency response.

## 3. COMPONENTS OF A FALL PREVENTION PLAN

### 3.1 POLICY FOR FALL PREVENTION

(a) A policy for fall prevention will set clear and unambiguous terms on the organisation's approach and commitment towards fall prevention.

(b) Top management with executive or site responsibility shall define, endorse and document its policy for fall prevention. The policy for fall prevention shall be appropriate to the needs, nature and scale of the organisation's activities and work at height risks.

(c) The organisation shall establish a policy which demonstrates its commitment to prevent falls from height incidents, comply with applicable legal and other requirements.

(d) It is important that the policy for fall prevention is understood, implemented and maintained at all levels of the organisation. The policy for fall prevention should be reviewed periodically and amended as and when necessary.

### 3.2 RESPONSIBILITIES

(a) Top management needs to ensure that sufficient resources essential to the establishment, implementation and maintenance of the fall prevention plan are made available so as to achieve its objectives.

(b) Competent person(s) shall be appointed to develop, implement, maintain and evaluate the fall prevention plan. The fall prevention plan must be developed specific to the conditions of the premises, that is, on a site-by-site basis.

(c) The appointed competent person(s) shall define, document and communicate the roles, responsibilities and accountabilities of all levels of staff that may be affected by the fall prevention plan. It shall include the following:

(i) To evaluate the need to work at heights;
(ii) To ensure that all reasonably practicable measures and methods are taken to eliminate potential falling from heights hazards;
(iii) To ensure that all workers (inclusive of subcontractors' workers) are properly trained in the use, maintenance and care of personal fall prevention and arrest equipment and the recognition of hazards related to their use;
(iv) To ensure that all devices /equipment/ materials used for fall prevention and arrest by workers (inclusive of subcontractors' workers) are maintained at design specifications and are inspected/ certified as per manufacturer and/or local regulatory/ approved standards;
(v) To implement emergency response procedures and to investigate all falls from height incidents; and
(vi) To ensure compliance with all applicable regulatory requirements Workplace safety and health (general provisions) regulations, 2014 and reporting of performance to top management for review.

## 3.3 SUPERVISOR

(i) A competent person should be appointed to provide proper and adequate supervision for workers to ensure that they are not exposed to hazards and all reasonable precautions have been taken where there is a risk of falling.

(ii) Ensure that all of his workers are compliant to the requirements of this document.

(iii) Supervision is especially important if the workers are undergoing training, or are new or inexperienced and unfamiliar with the working environment.

(iv) It is essential that persons performing supervisory roles must be competent and have the skills and knowledge of the work processes that they are to supervise.

(v) Persons performing supervisory roles shall ensure that:

- Required safety measures are in place before the commencement of the work;
- They remain vigilant and do not lose focus on the task at hand and never get involved in any work activity that could potentially distract them from effective supervision of the work;
- Additionally, workers are particularly well supervised when working in any elevated position above 2 metres or from any point where they can fall and be injured; and
- Only workers who have received appropriate training and instruction in relation to the tasks they are to perform are to carry out the work.

## 3.4 HSE OFFICER / SAFETY CO-ORDINATORS

Responsible to make random HSE inspections of the factories/worksite on a routine basis.

## 3.5 SUPERVISION OF WORK

a) The supervision of work is important and should be carried out by an appointed and qualified supervisor. Without proper supervision, workers may violate rules and regulations or adopt unsafe practices and put themselves at risk.

b) Supervisors should ensure that workers adhere to all the safety requirements such as using their individual fall arrest system correctly. They should also be trained to spot and identify any unsafe work practices among workers.

c) A buddy system should be encouraged in your company so that workers can help to remind and encourage each other on the safe work practices even in the absence of a supervisor.

## 3.6 RISK MANAGEMENT

### 3.6.1 HAZARD IDENTIFICATION AND RISK ASSESSMENT

a) Hazard identification and risk assessment are fundamental tools to identify hazards associated with workplace activities, assess their risk levels and determine the suitable control measures to be taken.

b) Employers, principals (including contractor and subcontractor) and self-employed persons are required to discharge their duties in identifying the hazards and conducting risk assessment in relation to the safety and health risks posed in the workplace, and to take all reasonably practicable measures to ensure that any person who may be affected by his undertaking is safe in the workplace.

c) Risk assessments should be conducted by a multi-disciplinary team who has a thorough knowledge of the work to be undertaken. The team members should include management staff, process or facility engineers, technical personnel, supervisors, safety personnel and workers whenever appropriate.

d) Hazard identification and risk assessments should be reviewed periodically with the work force, to ensure its effectiveness and validity, particularly when there is any significant change to the workplace activities; or when there is an occurrence of any fall from height incident.

e) Risk management involves identifying hazards, assessing risks, implementing appropriate control measures, and monitoring and reviewing those measures.

### 3.6.2 HAZARD IDENTIFICATION

a) Identifying hazards involves recognising any work process, activity or situation with potential to cause injury or harm to a person such as when a person works at the edge of a building without proper barricades.

b) It is important to plan the process for hazard identification and risk assessment. While the focus of this guidance is on the hazards of falling when working at heights, it is also important to address and extend to other workplace safety and health hazards such as manual handling, noise, hazardous substances, falling objects, slips and trips.

c) All hazards to which a person (including members of the public) could be exposed to as a result of work must be identified. The hazards must always be identified prior to work commencement and when changes to systems of work are planned or occur. Examples of workplace conditions that could have potential falls from height hazards are given in the list.

Work Environments that Pose a Fall from Height Risk

- Raised work surfaces such as slopes;
- Slippery work surfaces (wet, oily, dusty or glazed);
- Uneven work surfaces (e.g., broken ground or profiled roof sheeting);
- Cramped work surfaces;
- Work surfaces cluttered with tools, work materials and debris;

- Workers working in adverse weather conditions – for example, in rain, strong or gusty winds, extreme heat or high humidity, or very cold conditions;
- Unprotected edges;
- Work on temporary structures such as scaffolding and formwork;
- Building materials, large tools, or equipment that need to be manually carried;
- Overloading of working platform, which may lead to collapse; or
- Struck by moving object or equipment, for example, load from lifting operation.

d) Falling from height can result in serious injuries or death. It needs to be remembered that there is no 'safe height'. Anyone who is off the ground is at risk of falling. The hazard exists on platforms, scaffolds, ladders, flat and pitched roofs, open steelwork and any area where work is being done in proximity to fragile materials, openings, holes and roof edges.

e) For this reason, all work at height must be covered by a valid risk assessment.

f) There are various ways to identify potential hazards or situations that may result in a fall. Typically, consideration should be given to the following areas:

i. Previous injuries, "near miss" incidents or accidents involving the fall of persons that had occurred at the workplace or other similar workplaces;
ii. Consultation with stakeholders to find out what risks they may be exposed to when working at height. These stakeholders should include safety and health personnel, supervisors, engineers and technical personnel and workers;
iii. Walk-through inspections of the workplace; and
iv. Any other records or statistics which indicate potentially unsafe work practices.

(g) A hazard identification process or procedure may range from a simple checklist for specific equipment, such as a ladder or fall arrest system, to a more open-ended appraisal of a group of related work processes. Generally a combination of methods will provide the most effective results.

### 3.6.3 RISK ASSESSMENT

a) Risk assessment allows for the improvement of work conditions by identifying the hazards at the workplace and implementing effective risk control measures before they escalate into accidents and injuries. Under the Workplace Safety and Health (Risk Management) Regulations, 2014 every workplace, including worksites, should conduct risk assessments for all routine and non-routine work undertaken.

b) Prior to conducting risk assessment, adequate preparation must be done. A risk assessment team should be formed, preferably consisting of personnel from the various levels of participation in the work activity.

Relevant information should also be collated to facilitate better understanding of the work process.

1. Hazard Identification
   - Identify the hazards.
   - Identify potential accidents or incidents
2. Risk Evaluation
   - Estimate the risk levels of the workplace hazards identified.
   - Prioritise the hazards to be controlled.
3. Risk Control
   - Formulate the control measures according to the Hierarchy of Controls.
   - Analyse and evaluate the residual risks.

### Step 1: Identify the hazards

Determine the work activities that are being planned to be carried out. Identify and analyse the hazards associated with each work activity that involves persons working at height.

### Step 2: Assess and evaluate all hazards identified

Determine the possibility of someone falling or getting injured while working at height. Assess the risk levels for each of the hazards based on their likelihood and severity, taking into account the existing risk control measures. Risk level can be determined once the severity and likelihood have been established. This can be achieved by using a 3 by 3 matrix given below. The size of the matrix can be varied according to the complexity of the work conditions. The following chart illustrates how severity and likelihood come together to help determine the risk level.

**Risk evaluation Map**

| Determine Severity | | Determine Likelihood | |
|---|---|---|---|
| Minor | No injury, injury or ill-health requiring first aid treatment only (includes minor cuts and bruises, irritation, ill-health with temporary discomfort) | Remote | Not likely to occur |
| Moderate | Injury requiring medical treatment or ill-health leading to disability (includes lacerations, burns, sprains, minor fractures, dermatitis, deafness) | Occasional | Possible or known to occur |
| Major | Fatal, serious injury or life-threatening occupational disease (includes amputations, major fractures, multiple injuries, occupational cancer, acute poisoning and fatal diseases) | Frequent | Common or repeating occurrence |


| Determine Risk Level | | | |
|---|---|---|---|
| Likelihood/ Severity | Remote | Occasional | Frequent |
| Minor | Low Risk | Low Risk | Medium Risk |
| Moderate | Low Risk | Medium Risk | High Risk |
| Moderate | High Risk | High Risk | High Risk |

If the consequence of a hazard is identified to have moderate severity and occasional likelihood, the risk level may be determined to be medium.

If there is a risk that a fall may still occur, additional safety measures need to be put in place to control the risk. The primary duty is to eliminate the risk at source where possible. If elimination is not practicable, the risk must be reduced so far as is reasonably practicable following the hierarchy of controls outlined in Step 3.

### Step 3: Control the risk

Based on the risk level determined in Step 2, risk controls should be selected to reduce or confine the risk level to an acceptable level. The following table suggests the acceptability of risk for different risk levels.

| Risk Level | Acceptability of Risk | Recommended Actions |
|---|---|---|
| Low | Acceptable | No additional risk control needed. Conduct periodic review to ensure that the assigned risk level is accurate and does not increase over time. |
| Medium | Moderately Acceptable | Evaluate hazards carefully to ensure that risk is reduced to as low as reasonably practicable within a defined time period.<br>Interim risk control measures, such as administrative controls may be implemented.<br>Attention by management is required. |
| High | Not Acceptable | Risk level must be reduced to at least medium risk before work commences.<br>Interim risk control measures should not be used. Risk control should not overly rely on personal protective equipment. If possible, the hazard should be eliminated before work begins.<br>Immediate involvement by the management is required before work commences. |

(a) In order to prioritise the risk controls adequately, the formulation of such risk controls may take into consideration the relative risk levels of the different hazards and the cost and benefit of the controls. The residual risk after the implementation of the controls should also be evaluated.

(b) Reasonably practicable measures must be taken to maintain the risk level within the acceptable range. It is essential for risks to be eliminated or reduced 'at source'. If the risk level is high, work cannot commence until the risk level is reduced to the medium level or below.

(c) These risk controls must be effective and practicable. To control hazards and reduce risks, follow the hierarchy of control methods. It may be necessary to use more than one of these measures to reduce a risk to its lowest possible level when no single measure is sufficient on its own. Only where it is not reasonably practicable to use a higher order control, should a control at a lower level be used.

### 3.6.4 ENSURING CONTROL MEASURES ARE SAFE AND DO NOT INTRODUCE NEW RISKS

It is important that the control measures selected do not introduce new hazards or expose workers who are installing, erecting or removing these control measures (such as scaffolding) to a greater risk than the one it is designed to control.

### 3.6.5 MAINTAINING AND RE-EVALUATION OF CONTROLS

The control measures implemented must be regularly monitored and reviewed to ensure that they are effective and are in good working condition.

## 3.7 RISK CONTROL MEASURES

### 3.7.1 HIERARCHY OF CONTROLS FOR WORK AT HEIGHT

a) If workplace safety and health risks exist, the employer, self-employed person or principal shall, as far as reasonably practicable, put measures in place to control those risks.

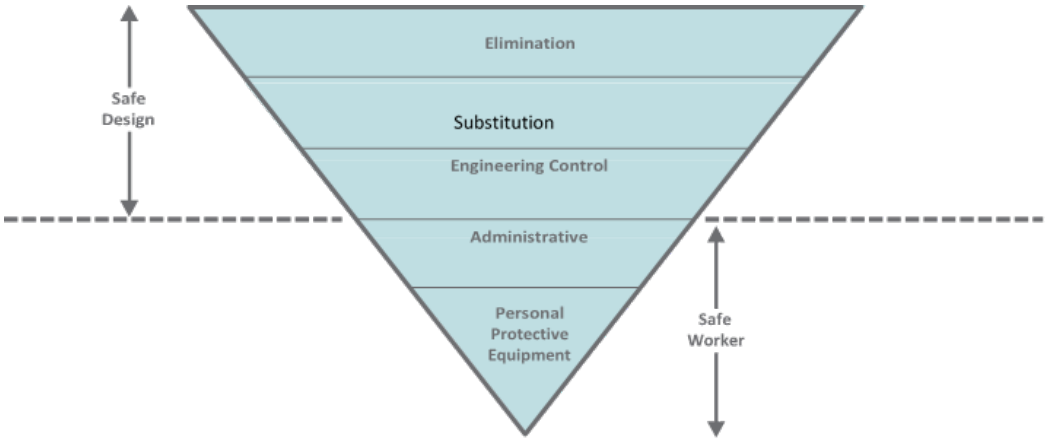
b) The appropriate control measures/ methods selected to reduce or maintain the risk of falling from heights shall be carefully assessed and implemented to ensure its effectiveness.

c) If workplace safety and health risks exist, the employer, self-employed person or principal shall, as far as reasonably practicable, put measures in place to control those risks.

d) The appropriate control measures/ methods selected to reduce or maintain the risk of falling from heights shall be carefully assessed and implemented to ensure its effectiveness.

e) The approaches below are listed according to a hierarchy of control as shown. The approach to control measures should be attempted from the top of the hierarchy onwards. These controls are usually not mutually exclusive, for example, engineering controls can be implemented concurrently with administrative controls.

A hierarchy of risk controls for working at height should be applied as detailed below:




## Level 1: Elimination

(a) Elimination of hazards refers to the total removal of the hazards and hence effectively making all the identified possible accidents and ill health impossible.

(b) This is a permanent solution and shall be attempted in the first instance. If the hazard is removed, all the other controls, such as the use of fall prevention and protection system, workplace monitoring and surveillance would no longer be required. In effect, the item is removed from the table of hazards.

(c) Examples of elimination include:

- Prefabrication of roofs at ground level.
- Using remote released shackles for crane lifted loads positioned at height.
- Prefabricating wall frames horizontally before standing them up;
- Using precast tilt-up concrete construction instead of concrete walls constructed in situ; and
- Using paint rollers with extendable handles rather than working on a ladder.

(d) If eliminating the hazard is not reasonably practicable, then measures that reduce the hazard should be considered and implemented, where reasonably practicable to do so.

(e) Design for Safety

- The purpose of designing for safety is to eliminate or reduce risk at source by taking into consideration foreseeable risks at the planning and design stage so that these risks can be removed, or mitigated by designing around the risk.
- In identifying the foreseeable risks, the work activities of persons involved in the following stages should be taken into consideration:
    - Construction and/ or installation;
    - Usage;
    - Maintenance and/ or cleaning; and
    - Demolition and/or decommission.

- It is also important to consider risks that are posed to persons not directly involved but affected by the work such as visitors, customers or members of the public.

## Level 2: Substitution

(a) This involves replacing the hazard by one that presents a lower risk. For example, by using mobile elevated work platform (MEWP) instead of ladders for reaching high places, the risk level is lowered as MEWP generally provides a higher level of safety for working at heights than ladders.Undertaking the work using a fall prevention system.

(b) Fall prevention systems are 'materials or equipment', or a combination of both, that are designed and intended to prevent a person from falling. When using fall prevention systems, it is important to ensure that after the initial installation, no adjustments, alterations or unauthorised operations are performed by any person, except for performing regular checks or maintenance. This is to ensure that the performance integrity of the device is ensured. Some examples of fall prevention systems are scaffolds, mast climbing work platform and aerial work platforms.

### Scaffolds

(c) Scaffolds are a common means of providing a safe work platform for working at height, however, certain guidelines still have to be followed to make working on scaffolds safe.

(d) Mast climbing work platform
Mast climbing work platforms can be set up in either a single mast or multi-mast configuration. The erection and dismantling of it must be carried out by competent persons. It should be installed, used and maintained according to the manufacturers' manuals.

(e) Mobile elevated work platforms
Mobile elevated work platforms (MEWPs) such as scissor lifts and boom lifts are types of elevated work platforms used to position workers, materials or equipment at height. The persons working on MEWPs are protected by physical barricades to prevent falls. Ensure that platforms are fitted with a safety interlock system to prevent accidental toppling. Workers working on the MEWP should wear safety harnesses with a short lanyard and anchor it properly. All MEWPs should only be used on a solid level surface and within the load limit. It should not be used in high wind conditions or on uneven ground.

## Level 3: Engineering Controls

(a) The use of engineering controls such as barriers or guardrails can also improve safety while working at height by providing a barrier to workers against falling.

Barricades/Guardrail
Guardrails may be used to provide effective fall protection at:

- The perimeters of buildings or other structures;
- The perimeters of skylights or other fragile materials;
- The openings in floor or roof structures; and
- The edges of shafts or other excavations.

Guardrails should meet the following requirements:

- Be fitted for all locations where there is potential to fall from height and as a minimum for locations 2m above the working level;
- Incorporate intermediate guardrails between the platform and the topmost rail (also known as mid- rails); the distance between two adjacent guardrails or any work platform, workplace and the guardrail immediately above must not exceed 600mm; and
- Be designed and constructed to withstand its intended load.

Proper access and egress

- Should there be a risk of falling from height, proper means of access must be provided for workers to reach their working areas safely. Due consideration should be given to the tools and equipment that need to be moved to and from the work areas.

### Level 4: Administrative Controls

An administrative control reduces or eliminates exposure to a hazard by adherence to procedures or instruction.

Administrative control - Fall hazards

(a) Administrative controls are systems of work or work procedures that help to reduce the exposure of employees to fall hazards.

(b) One such work procedure is the 'permit-to-work' system which is used to control potentially hazardous work. It is an effective way of managing entry into or work on scaffolds.

(c) It provides a systematic framework to ensure that hazardous work is allowed to commence only after the work environment and condition have been assessed by competent persons to be safe and approved by the project manager, who would have knowledge and overall control of the worksite. With such a system in place, checks will be introduced at different stages of work, and the person responsible for endorsing the permit will be held accountable.

(d) Administrative controls may also be used to support or be used in conjunction with other control measures that are put in place. For example, safe work procedures may be needed to guide workers on the safe use of temporary work platforms, which in itself is a form of engineering control measure.

(e) The development of administrative controls should also involve people who perform work at heights tasks regularly, such as contractors and workers as they often have a good understanding of the risks involved.

(f) For effective use of administrative controls, it is necessary to ensure that information is adequately and effectively communicated to the workers. For example, daily toolbox meetings should be used for such purposes.

## 3.8 SAFE WORK PROCEDURE (SWP)

(a) The SWP provides a step by step account of how jobs are to be executed, who is in charge of these jobs, what safety precautions must be taken (based on the risk assessment made earlier) and what kind of training is necessary for the workers doing these jobs. The permit-to-work system has to be integrated with the Safe Work Procedure so that the supervisors are made aware of the safety requirements and checks.

(b) Safe Work Procedures (SWPs) are the most common form of administrative controls in workplaces. It is a set of systematic instructions on how work can be carried out safely. Using information obtained from risk assessment, a set of SWPs should be developed for various work activities that have a risk of falls from heights.

(c) A SWP generally provides instructions on how jobs are to be performed, persons involved in these jobs, what safety precautions must be taken and what kind of training and/or certification is necessary to be able to competently carry out these jobs.

(d) The SWP must be communicated to everyone involved in the job so that each person is aware of his roles and responsibilities. The SWP must also be communicated to those who will be affected by the job.

(e) It is necessary to provide adequate levels of supervision to ensure that SWPs are being followed. Regular review of the effectiveness of the procedures must be undertaken.

(f) Make sure that the work is well organised so that workers do not increase the risk of a fall for themselves or others. For example, sequence jobs so that different trades are not working above or below each other at the same time.

## 3.9 PERSONAL PROTECTIVE EQUIPMENT

(a) Personal protective equipment (PPE) should only be used as the final option where workplace safety and health is concerned. It is neither effective nor recommended to use PPE on its own for fall protection. However, when used in conjunction with other control measures, PPE can provide an additional degree of safety.

(b) A work positioning system is equipment that enables a person to be positioned and safely supported at a work location for the duration of the task being undertaken at height, e.g. a travel restraint system. Adjustable lanyards to be used alongside the lateral or ventral d-rings.

(c) Work positioning systems require a higher level of worker competency and supervision than other control measures which are higher on the hierarchy of control.

(d) The effectiveness of PPE as a control measure is dependent on the correct equipment being chosen, fitted and worn properly at all times when required by users.

(e) PPE/ Types of fall protection PPE should be selected taking into consideration the following factors:
- The type of hazard;
- Areas of the body that require protection;
- The degree of protection required;
- Ease of use, comfort and convenience;
- Compatible with other PPE;
- Condition of the equipment;
- Reliability; and
- Ease of maintenance.

(f) PPE that can be used for work at heights include:
- Travel restraint equipment;
- Personal fall arrest equipment; and
- Work positioning equipment.

(g) Before personal fall protective equipment is chosen as a control measure for work at height activities, the following conditions shall be fulfilled:

- The PPE is assessed to be suitable and adequate for the persons to conduct the assigned work at heights tasks safely;
- Persons issued with the PPE must be trained and possess the skill and knowledge to use the equipment/ system safely; and
- Suitable and adequate anchor points or lifelines that allow all persons to achieve 100 percent tie-off at all times shall be provided. All persons involved in work at heights must be made aware of the anchorages.

## 3.10 INSPECTION AND MAINTENANCE

(a) A thorough visual inspection and checks on equipment usage is important for ensuring that the equipment is free from observable defects. Equipment that have exceeded their serviceable life span or passed their expiry date should not be used.

(b) A maintenance programme should be established and implemented to periodically inspect and maintain both operational and safety equipment to ensure that they are in good working condition.

(c) The maintenance programme shall include the following components:
- An inventory of equipment that requires regular inspection and maintenance;
- Frequency of inspection and maintenance;
- Procedures of inspection and maintenance;
- Preventive maintenance, such as servicing;
- Repair for damaged items;
- Replacement for irreparable items; and
- Record keeping (such as for damages, flaws detected, any preventive maintenance, repairs or replacements done).

(d) Maintenance of equipment should only be performed by trained and competent persons.

## 3.11 INSTRUCTION AND TRAINING

(a) Persons working at heights who are exposed to the risk of falling should be provided with sufficient and adequate information, instruction and training so that they have the skill and knowledge to perform the work safely. It should help them understand:

- The nature of fall hazards to which they are exposed;
- The risk of injury associated with the task;
- The control measures that are needed, including SWPs and the use of PPE;
- The proper usage and maintenance of equipment, such as performing inspection to ensure that equipment are always in good condition before use; and
- Procedures to follow in the event of an emergency such as rescue, accident or injury.

(b) The amount of information and type of training depend on several factors such as the risks involved, the level of operator skill required and the complexity of the tasks and work procedures. Some common forms of training include:

- General induction course for new workers;
- In-house" training programmes; and
- Formal training courses offered by accredited training providers. Information can be disseminated during "Toolbox" briefings and "On-the-job" training.

(c) Information should be provided in a form that can be understood by all workers. This may include providing information in pictorial form or in languages other than English.

(d) If classroom teaching is conducted, it should be complemented by hands-on training to provide practical experience.

(e) Induction programmes are essential and should be provided for workers taking up new jobs or where work situations have changed. Records of training should be kept to enable on-going programme evaluation and review.

## 3.12 ACCIDENT / INCIDENT INVESTIGATION

(a) All accidents or incidents relating to falls from heights should be reported, investigated and analysed for the following objectives:
- Determine any underlying deficiencies in the existing fall prevention and protection system and plan, which might have contributed to the occurrence of the incident;
- Identify the need for corrective action to be taken to address any such deficiencies as identified; and
- Identify the opportunities for preventive actions to be taken to prevent any such incident from recurring.

(b) The results from any such incident investigated (inclusive of lesson learnt and the corrective/ preventive actions to be taken) should be promptly communicated to all relevant parties.

(c) A record of all accidents and incidents and their investigation findings and outcomes should be properly documented.

## 3.13 EMERGENCY RESPONSE

Emergency response procedures

(a) A written emergency response plan must be established and it should cover the procedures for handling emergencies relating to falls from height.

(b) In the event of a fall, it may be necessary to retrieve the injured worker from the site of the fall swiftly. Therefore, equipment needed to perform a rescue must be made readily available and workers need to be trained to perform a rescue. It is important that a worker who is suspended in a full body harness be rescued promptly. Studies have shown that unconsciousness from suspension trauma can occur in around 5 minutes; death can follow shortly, within a few minutes. Emergency response procedures must be put in place when work has to be performed at height.

(c) While developing these procedures, consider the different types of emergency and rescue scenarios that may arise. Use information obtained during the risk assessments to facilitate this task.

Proper consideration must be taken when choosing a suitable rescue kit

1) Distance to the ground
2) Location of fall
3) PPEs

Rescue kits should be visually accounted and inspected at least once a month by a competent person and documented.

Careful considerations on the types of anchor should also be noted, use only robust 'bombproof anchors', minimally 15kn.

(d) Effective emergency response procedures may require one or more of the following:

- Workers using safety harnesses should not work alone;
- A person trained in rescue techniques is allocated to each site; and
- Rescue equipment is readily available for use.

(e) The emergency response procedures must also cover the provision of first aid, they should:

- Specify how many workers will be trained in first aid, the competencies and the necessary first aid equipment required;
- Identify the nearest hospital and medical treatment rooms; and
- Establish means of contacting the emergency services promptly.

(f) As rescue operations are often carried out under extreme stress, consideration should be given to all aspects of the rescue process. Elements to consider should include:

- Rescue method or equipment required and readiness onsite;
- Procedures to gain access into less accessible areas;
- Training required for rescuers and first aiders;
- An effective and readily available means of communication.

(f) Workers must be provided with information on the emergency plan including:

- Who to approach or call in the event of an emergency; and
- The procedures to follow for emergencies, including those for persons suspended in safety harnesses during fall arrest. It is recommended that training in self-rescue/self-relief techniques, such as the use of a suspension trauma straps be provided for workers using safety harnesses.

(g) Persons assigned to first aid duties must be competently trained.

(h) The immediate rescue of a person after an arrested fall can prevent the onset of injuries such as suspension trauma which can occur when a person is suspended in a harness over a period of time. It should be noted that harnesses can become deadly whenever a worker is suspended for a duration over five minutes. Suspension trauma is the development of presyncopal symptoms and loss of consciousness if the human body is held motionless in a vertical position for a period of time. Can be fatal within 30 minutes of the initial fall.

## 3.14 TRAINING IN THE PREVENTION OF FALLS

(a) Information, instruction and training should be given to provide your employees with the skills and knowledge they need to perform work at height safely. It should help them to understand:

- The fall hazards to which they are exposed;
- The risk of injury associated with the task;
- Why control measures are needed and how to use them properly; and
- What actions to take if there is an incident.

(b) Working at height requires the operator to be properly trained to use the systems employed to prevent falls. The training depends on the level of operator skill required to operate or use the control measure.

(c) Tasks involving complex work procedures or risk control measures require a comprehensive training process. Whatever level of control is used, a high level of competency must be achieved.

(d) Where guardrails are being used, employees need to know why the guardrail system is needed and the limitations of the system. They should, for example, be instructed not to stand on, climb over, or remove any part of the guardrail system.

# SECTION B: FALL CONTROL MEASURES

## 4. ACCESS TO AND EGRESS FROM WORK AREAS

### 4.1 ACCESS AND EGRESS RISK AND ASSESSMENT

(a) Employers are to provide a safe means for people to get to and move around the work area. The planning for the provision of suitable access and egress should take into account the tools and equipment that people will be required to carry.

(b) Where an area accessed poses a risk of falling, occupiers should control access to it. Only persons who need to carry out work in the area and are competent to do so are to be allowed access.

### 4.2 ACCESS AND EGRESS SAFETY CONSIDERATIONS

In providing safe and proper access to and egress from a work area, the following should be considered:

- Installation of fixed work platforms, walkways and stairways;
- Use of temporary work platforms such as scaffolds and crawl boards;
- Installation of fall arrest systems;
- Frequency and number of people who may need access to or egress from the work area. Supervision and regular inspection should also be considered;
- Provision of safe work surfaces;
- Method of getting equipment and materials to the work area;
- Exposure of access ways to the weather (e.g., rain can make surfaces slippery and strong winds can cause loss of hand grip);
- Provision of adequate natural or artificial lighting to all access ways;
- The clearance of obstructions so that persons are able to move easily to and from the workplace; and
- Location and space required for any equipment or materials used or being temporarily stored.

### 4.3 ROOF ACCESS

(a) Employers and occupiers should provide their workers with a safe means of getting to and from the roof. The access ways need to be in place before commencing work. Access should be located where the work on the roof is to begin.

(b) For new roof installations or where extensive repair or replacement of existing roofs is planned, it is recommended that an access tower or a personnel and materials hoist be provided.

(c) After a roof membrane has been installed, special provisions may need to be made if the roof is to be used as a platform for access, egress, work or storage. If access and egress are required regularly, a permanent system such as stairs may need to be installed. Stairs should serve each floor of a building or structure that is being constructed or demolished.

(d) Where there is potential for persons to fall through the roofing material, due to material choice or integrity concerns, supervisors shall ensure that suitable and robust measures are in place to protect persons from falling from height.

## 4.4 ACCESS TO TOP OF VEHICLES / CONTAINERS

(a) Where possible, employers and occupiers should provide systems and equipment to allow workers to work on ground level. Some examples include:

- Installation of access gangway for inspection purposes to eliminate the need to climb on top of containers/ tanks ; and/ or
- Bundling or securing load unto purpose design racks or intermediate bulk containers before loading on to vehicles, instead of stacking them manually while working at heights.

(b) Employers and occupiers should provide their workers with a safe means of access and egress should there be a need for workers to work on top of the vehicle/ container. Some examples include:

- Truck loading gangways and gantries; and/ or
- Use of portable access platform (see Fig 4.1).

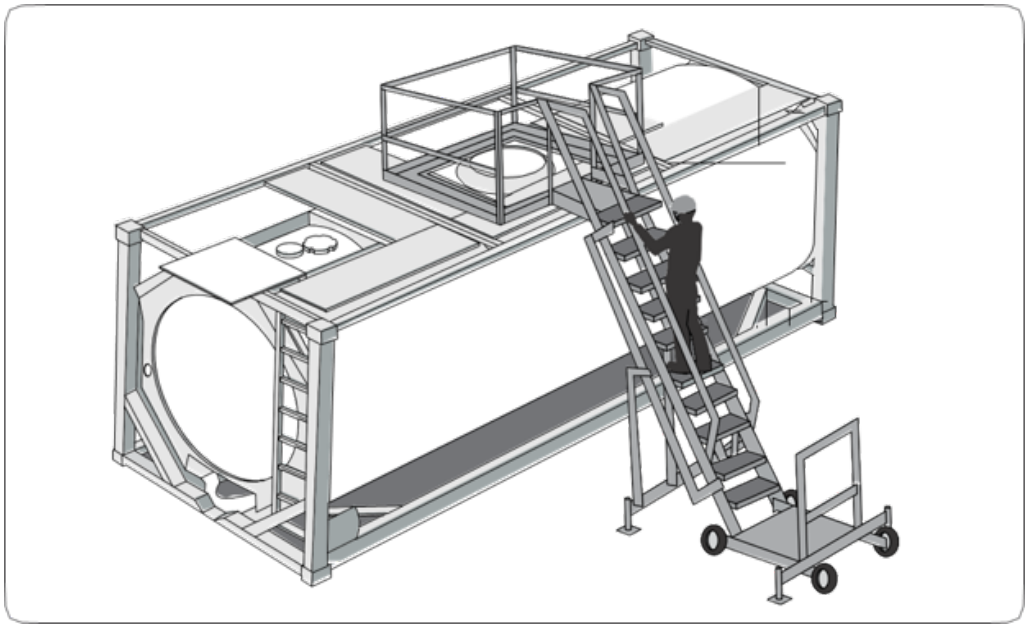


Figure 4.1: Portable access platform for safe access to top of ISO tank.

# 5. FALL PREVENTION SYSTEMS

## 5.1 EDGE PROTECTION, PERIMETER GUARD-RAILING

(a) Edge protection (often referred to as a "guard-rail") is used to reduce the risk of a person falling from open sides (see Fig 5.1) and through openings.

(b) Edge protection must be provided to the edge of a scaffold, walkway, ramp (see Fig 5.2 and 5.3), and landing or wherever a person is at risk of falling from open sides. The protection must also be able to withstand the impact of a person falling against it.

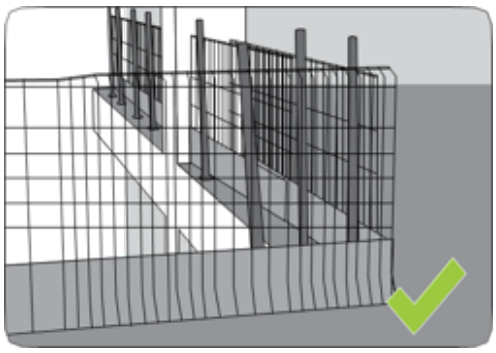


Figure 5.1: Perimeter guard-railing.

Figure 5.2: Unprotected stairways pose a falling hazard.

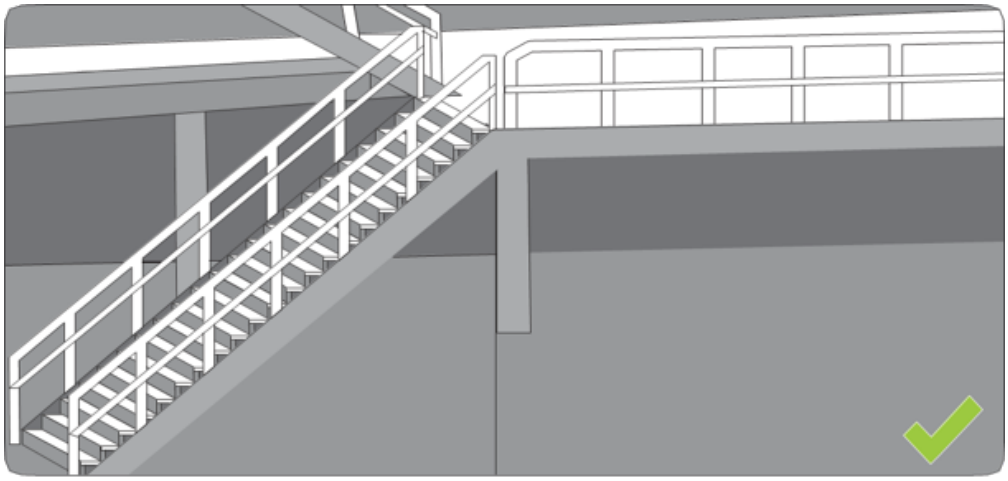


Figure 5.3: Stairways fitted with handrails.

(c) Edge protection must also be provided at any other edge at the workplace where a person could fall. Such protection must adhere to dimensions (see Fig 5.4) and other requirements listed below.

i. Temporary or advance guards must be provided to reduce the risk of a scaffold erector falling from the uppermost, unsecured or exposed scaffolding level during the process of erecting or dismantling scaffold;

ii. The guard-rail system must be of good construction, in good condition and be able to withstand the weight of a person (at least 100kg, applied in any direction at any point);

iii. If access points are required for equipment (e.g., a hoist), they should be protected adequately with gates, safety chains or any other effective means to prevent a person from falling. The access points must always be covered and secured when not in use (see Fig 5.5 and 5.6);

iv. Where guard-rail systems are intended to be used in conjunction with steel structures or tilt-up construction, designers and builders should plan for the guard-rails and fixings to be attached to the panels prior to the structures being raised from the edge protection that is being used. This will reduce the risk of a person falling from one level to another.

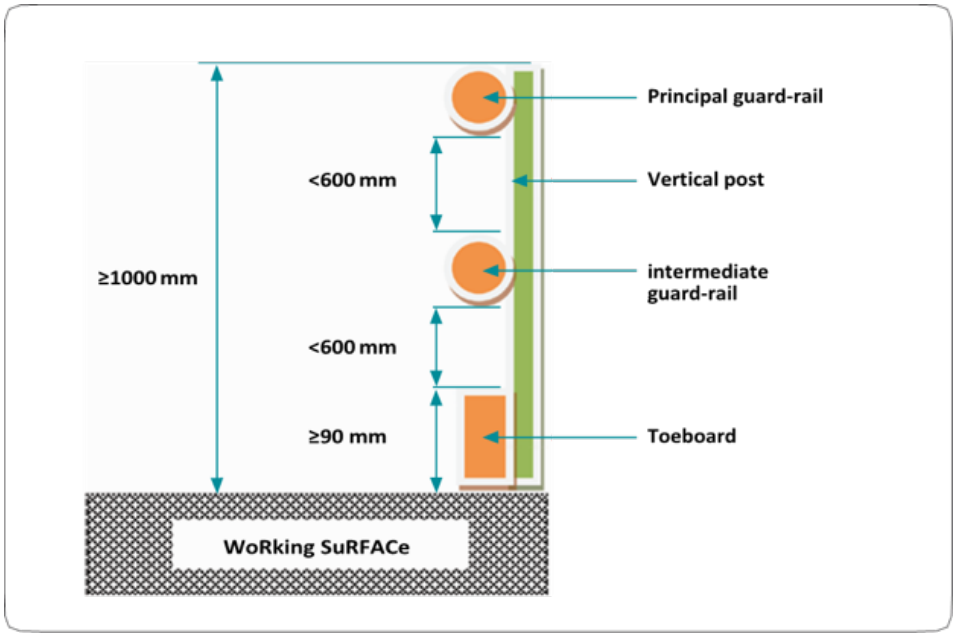



Figure 5.4: Dimension requirements for a temporary edge protection.

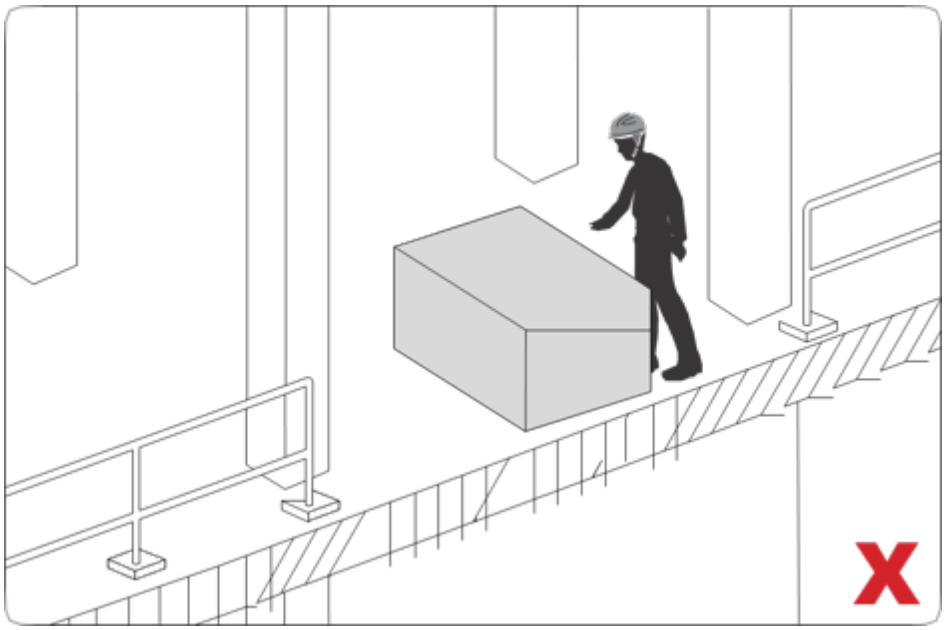


Figure 5.5: Inadequate demarcation and worker protection during temporary removal of edge protection.

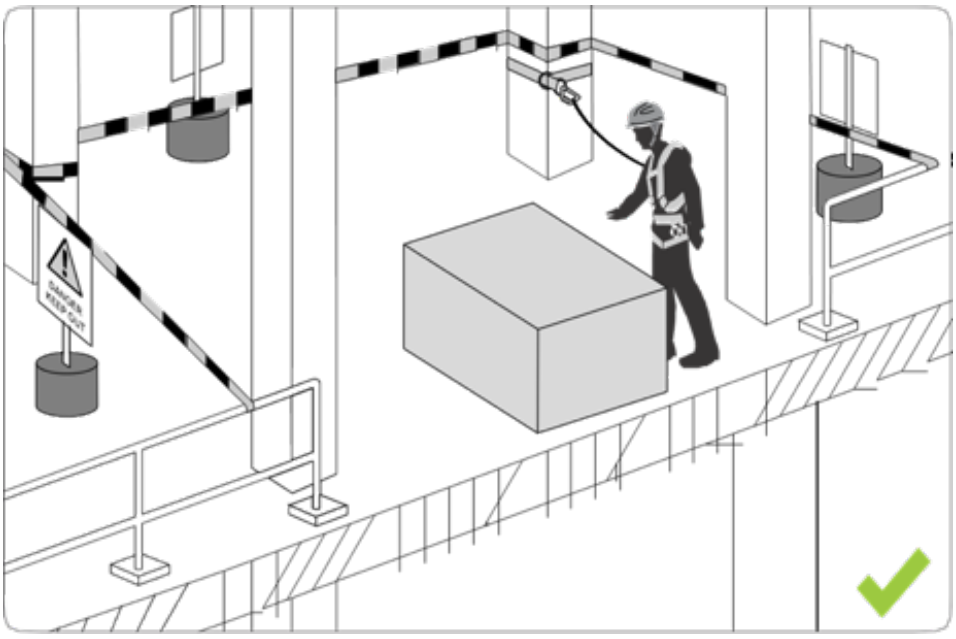


Figure 5.6: Example of proper demarcation and travel restraint for worker during temporary removal of edge protection.

## GUARDING OF OPENINGS

(a) Openings on floors or platforms present significant hazards. A person may fall through an opening, which may result in serious injury or death. If the opening that is stepped upon is small, cuts and bruises may result on the legs or feet. (see Fig 5.7).

(b) A person may fall through or step into openings such as lift openings and stairwells. A barrier should be erected around the opening to prevent persons from falling. In addition, the opening should be guarded with embedded wire mesh and covered with material of adequate strength to prevent entry by objects or persons. The cover should be secured to prevent it from dislodging.

(c) When an opening is protected by a cover, a suitable signage such as that shown in Fig 5.8 should be placed nearby or onto the cover itself to warn people of the hazard.

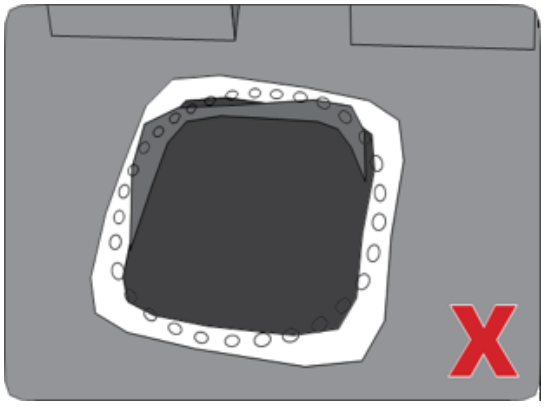


Figure 5.7: Unprotected openings are severe hazards and must be covered or barricaded.


Figure 5.8: A warning sign can be affixed
to the opening cover or placed near a barricaded opening.

## 5.2 SCAFFOLDS

(a) Scaffolds are any temporary structures:
- On and from which a person performs work in any workplace;
- Which enable a person to access the location to perform work; or
- Which enable materials to be taken to any place at which work is being performed.

(b) All scaffolds and their components must meet the requirements of the regulations stipulated under the Workplace Safety and Health Order, 2009, in particular the Workplace Safety and Health (Construction) Regulations, 2014.

(c) Generally, scaffolds must be erected by an approved scaffold contractor unless it is a tower scaffold, a trestle scaffold, or a scaffold.

(d) All scaffolds must be inspected by a scaffold supervisor:
i. Before its first use;
ii. After substantial alteration;
iii. After any event likely to have affected its stability; or
iv. Once it has been in place for 7 days.

At intervals not exceeding 7 days, scaffolds must be inspected, and a written report made.

(e) In addition, all hanging scaffolds, from which a person may fall more than 2m must also be constructed and installed in accordance with the design and drawings of a professional engineer.

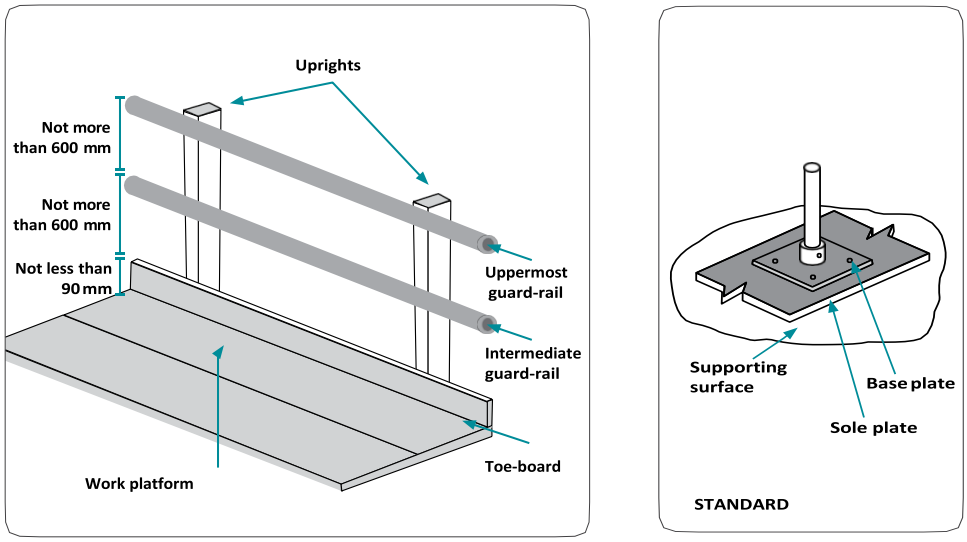



Figure 5.9: Scaffold with components labelled.

## 5.3 TOWER SCAFFOLDS

(a) Tower scaffolds are particular forms of scaffolding that usually consist of fabricated frame units constructed as single-bay towers. Most available tower systems are aluminium, but steel systems are also available. A tower scaffold that is fitted with castor wheels equipped with effective locking devices is deemed to be a mobile tower scaffold (see Fig. 5.10).

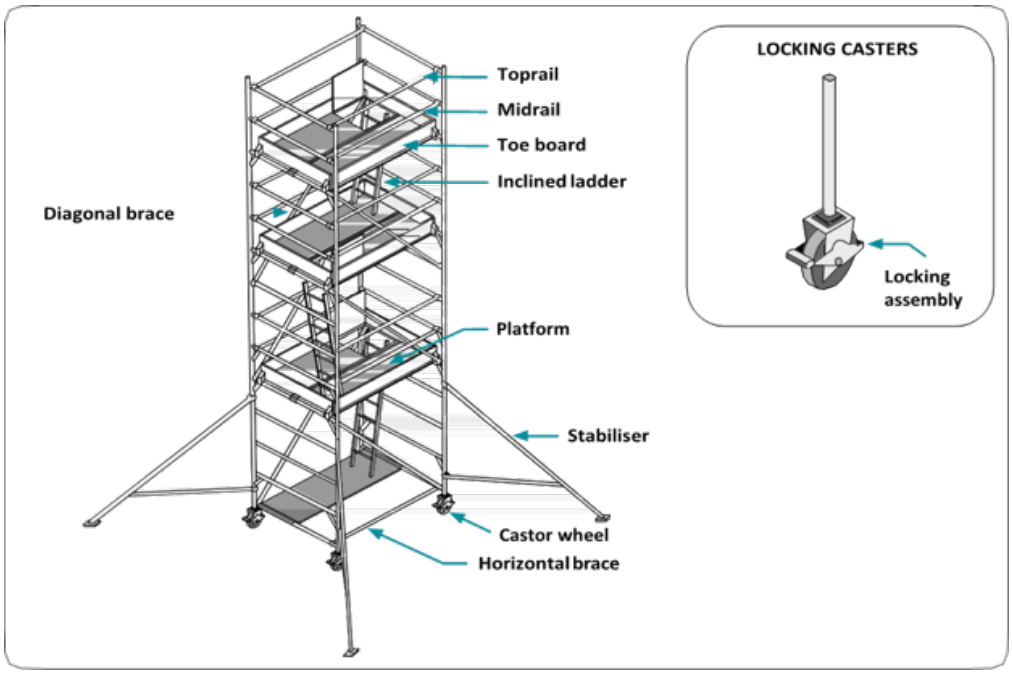



Figure 5.10: A mobile scaffold with access ladder, opening and other features to provide a hazard-free working platform.

(b) Edge protection such as guard-rails must be provided at the highest landing.

(c) When a tower scaffold is mounted on castors for use as a mobile scaffold, the following rules should be strictly observed:

(d) Prior to moving, the route must be checked for power lines, overhead obstructions and for holes and uneven surfaces on the ground;

(e) When it is necessary to deploy tower scaffolds on an inclined surface, measures must be taken to ensure stability, such as the use of outriggers. Otherwise, tower scaffolds should not be deployed on an inclined surface;

(f) Never access the scaffold until all its castors are locked to prevent movement;

(g) Never shift or move the scaffold while anyone is on it; and

(h) Do not cover the scaffold with containment sheeting such as shade cloth, unless it has been specifically designed for the purpose and it is only used in an enclosed, wind-protected environment.

## 5.4 MOBILE ELEVATED WORK PLATFORMS

(a) A mobile elevated work platform (MEWP) is a mobile machine consisting of a work platform surrounded by an edge protection system with controls and an extending structure that is intended to position persons, tools and materials at heights. Examples of MEWPs include scissor lifts, boom lifts and vertical personnel platforms (see Fig 5.11).

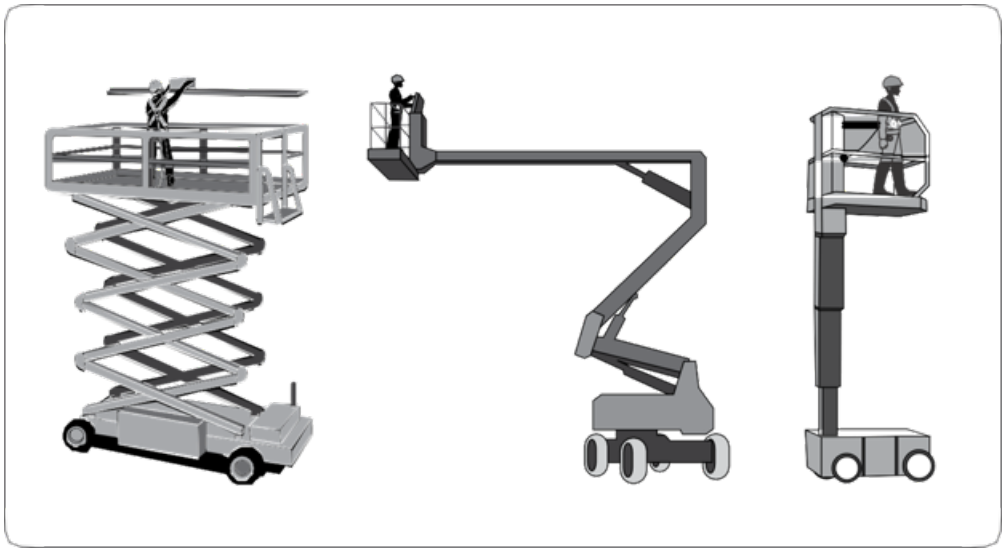


Figure 5.11: Examples of MEWPs; scissor lift (left) boom lift (middle) and vertical personnel platform (right).

(b) Prior to deploying MEWPs, thorough planning is needed; a site assessment of the area and ground on which the MEWP is required to operate should be conducted. This is to identify hazards associated with the task and the need for any additional corresponding risk control measures.

(c) MEWPs are available in various rated capacities, working heights and reach; some are intended for indoor use only, while others are designed for rough terrain. A suitable and adequate MEWP should be selected for the task to be undertaken.

(d) The selected MEWP shall be:

- Operated according to the manufacturers' specifications and design intent (e.g., safe working load limit, terrain type, outriggers deployment); and

- Equipped with all safety devices as per manufacturers' specifications. There must be no unauthorised modification, bypass or removal of any such devices.

(e) Employers shall ensure that only competent operators are tasked to operate MEWPs. MEWP operator competency includes:
- A familiarisation for the model/s of MEWP they are required to operate.

(f) While working at heights in a MEWP, the operator shall ensure that:
- All persons on the MEWP use appropriate PPE (for work at heights), including a travel restraint system anchored to the manufacturers' designated anchor point inside the MEWP (see Fig 5.11, left);
- All persons maintain a firm footing on the MEWP floor – climbing on guard-rails (Fig 5.12, right) or the use of other devices to achieve additional height or reach is prohibited; and
- When other moving equipment or vehicles are present, additional precautions (e.g., barricade, traffic management measures) are in place.

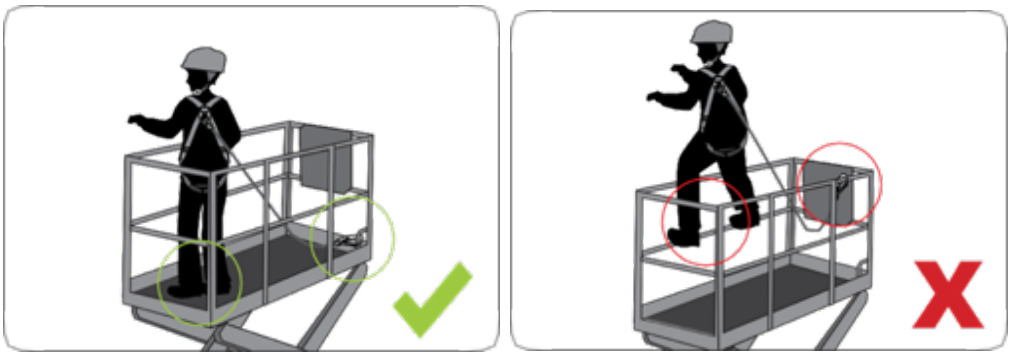


Figure 5.12: Correct method of working in an MEWP (left) and unsafe practices (right).

(g) MEWPs are not specifically designed to transfer personnel from one level to another, or for persons to enter/ exit the work platform at height; it should only be considered as an option after ensuring that:
- Access/ egress at heights is not prohibited by the manufacturer;
- There are no other reasonably practicable means to provide the access to the level or the work area;
- A thorough risk assessment is conducted to assess all additional risks (e.g., falling of persons, falling of objects or sudden movement of the MEWP).

## 5.5 SUSPENDED SCAFFOLD

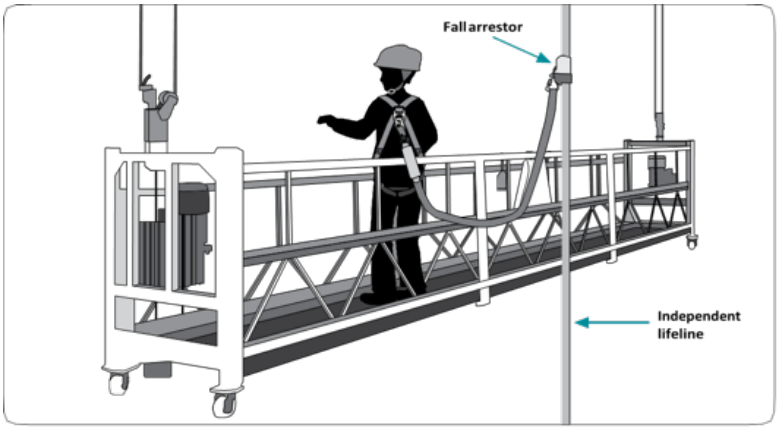



Figure 5.13: A suspended scaffold is mainly used for performing work on the sides of buildings.

Workers should be protected by a personal fall arrest system with an independent vertical lifeline anchored from the top of the building.

(a) A suspended scaffold (see Fig 5.13) is a power-operated suspended working platform that is fixed to a building structure. It is used for access during building maintenance or window cleaning.

(b) During the planning stage, consideration should be given to the methods by which maintenance, repairs or cleaning will be undertaken on buildings or structures.

(c) Consideration of future maintenance requirements in the early design stage will avoid the possibility of unsafe work practices occurring during routine maintenance. Sloping building exteriors and recline windows require priority consideration to ensure that maintenance can be carried out in a safe manner.

(d) Considerations for safe operation of suspended scaffolds include, but are not limited to:
- Never exceed the rated safe working load:
  - the safe working load must be clearly communicated to intending persons, this includes the equivalent number of persons and amount of material allowed;
- Anchorage must be adequate to support the weight of the scaffold, occupants and other load, and provides stability against overturning;
- The suspended scaffold must be inspected to be in good condition (e.g., decking, guard-rails, hooks and shackles) and tested periodically;
- Adequate primary and secondary (emergency) brakes must be provided and tested periodically;
- Suspended scaffolds must be inspected at least once every seven days by a scaffold supervisor (suspended scaffold) and examined once every six months by an authorised examiner;
- Lifting and climbing of the suspended scaffold should be at a speed to avoid undue swinging and controlled using a "dead man's switch" such that when application is released, the power will be cut;
- Persons on the suspended scaffold must be provided with the suitable PPE (for work at heights), anchored to a lifeline or anchorage that is independent of the suspended scaffold; and
- Persons working on suspended scaffold must be competent and are adequately supervised.

## Mast Climbing Work Platforms

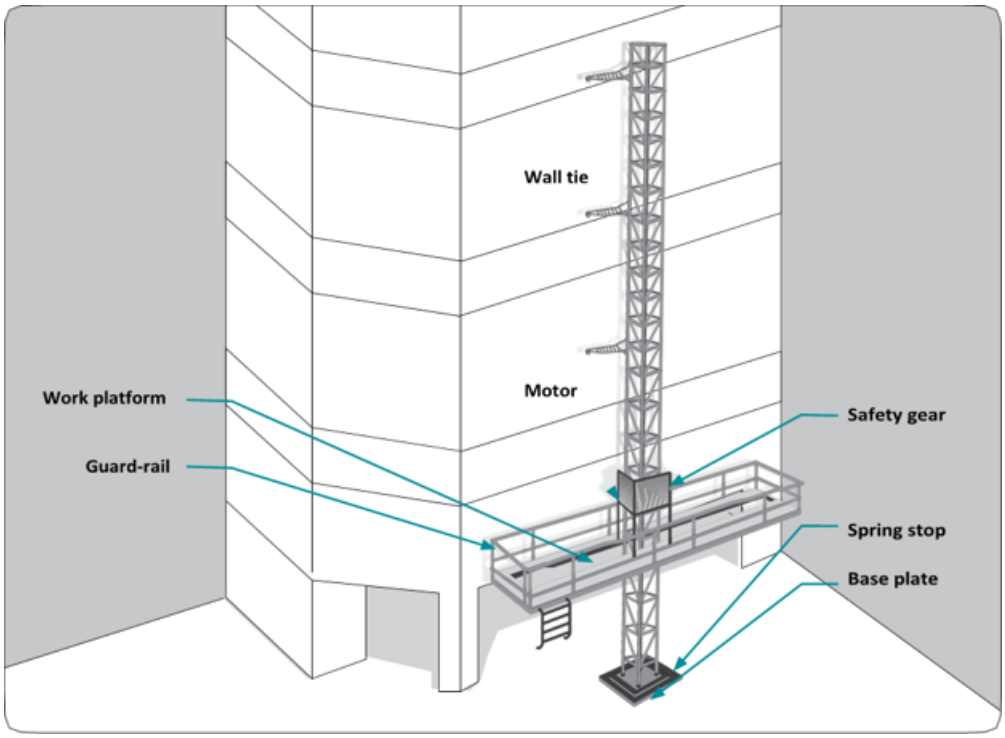



Figure 5.14: A mast climbing work platform is used to raise personnel and materials to the working position.

(a) Mast climbing work platforms (see Fig 5.14) are hoists that have a working platform used for temporary purposes to raise personnel and materials to the working position.

(b) Mast climbing platforms are generally not suitable for use where the profile of a structure changes at different elevations, for example, where upper floors of a building "step" back or balconies protrude from the building.

(c) The erection and rigging of mast climbing work platforms should be carried out or directly supervised by a competent person.

(d) Items transported inside the mast climbing work platform must not protrude out from the machine, they may fall out if caught on external objects.

(e) Operators working in mast climbing work platforms should be competent and protected by a suitably anchored full body harness.

# 6. ANCHORAGE AND LIFELINES

## 6.1 APPLICATION

(a) Anchorage and lifelines should be used if it has been assessed that falls cannot be prevented using fall prevention systems outlined in chapter 5 of these Guidelines.

(b) Anchorage and lifelines are part of personal fall prevention/ arrest systems that include:
- Travel restraint system to exclude persons from falling risks;
- Personal fall arrest system to arrest a fall in an inadvertent accident; and
- Work positioning system (methods of which may require higher competency levels).

(c) Anchorage and lifelines shall be of good construction and come with the relevant certificate of conformance to recognised international standards. Anchorages and lifelines shall be selected, installed, inspected and certified to be suitable and adequate by a competent person.

## 6.2 ANCHORAGE

(a) Anchorage, also known as "anchor points" is a part of an anchor for PPE (for work at heights) to be attached to. Anchors can be installed as a permanent or temporary fixture to a building or placed around a suitable structure (see Fig 6.1).

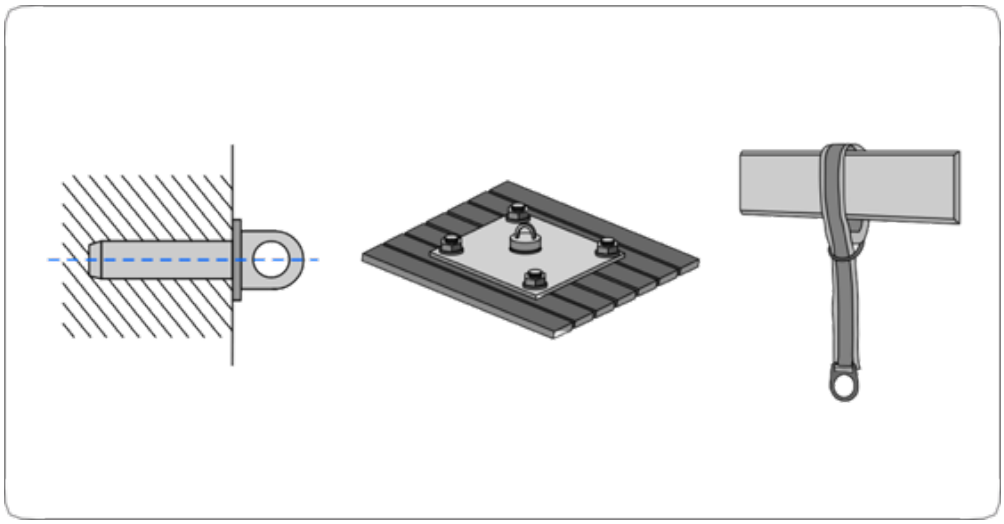


Figure 6.1: Examples of anchor devices – eyebolt (left), roof anchorage (centre) and anchor sling.

(b) In general, anchorage should be positioned above the user where possible. This will help to ensure that there is as little slack in the users' lanyard as possible.

## 6.3 LIFELINES

(a) Lifelines are flexible or rigid lines connected at least to one end to a reliable anchor to provide a link between the anchor and the user of a personal fall prevention/ arrest system.

(b) Lifelines should meet the following characteristics:
- Safe rating high enough to withstand forces generated in the event of a fall; and
- Installed in a proper manner such that they do not interfere with any other items of equipment or clothing, or create any tripping hazards.

(c) The three main categories of lifelines are horizontal (see Fig 6.2), vertical and self-retracting lifelines.

Figure 6.2: An example of a horizontal lifeline.

(d) A self-retracting lifeline (SRL) (see Fig 6.3) involves a spring-loaded reel to ensure the shortest possible length of lifeline between the user and the reel. Where SRLs are used, it is important to note that unless tested and permitted by manufacturer:
- SRLs must not be used in the horizontal plane;
- SRLs must not be attached to a horizontal lifeline;
- A lanyard (with or without energy absorber) must not be attached between the SRL and the full body harness as this may increase the fall distance; and
- Attachment of more than one user to each SRL must not be allowed as overloading may occur.

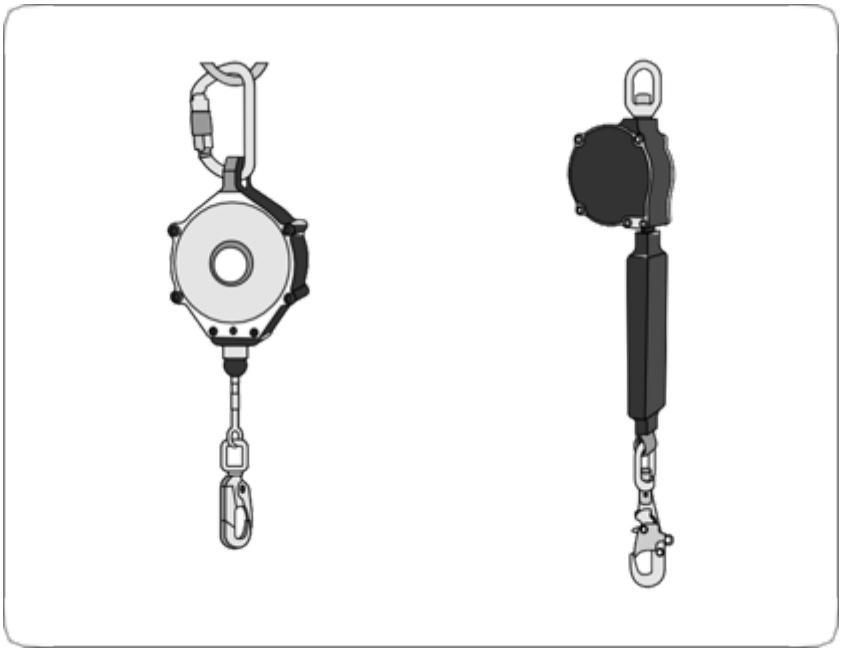


Figure 6.3: Examples of self-retracting lifelines.

(e) Lifelines are to be certified as a system by a competent person. Components should not be used independently; components from different manufacturers should not be used together unless it is specified or advised by the manufacturer.

(f) It is critical to install and use lifelines according to the manufacturers' specifications. Any misuse may cause the fall prevention/ arrest systems to fail to provide the intended protection from falls. Always consult or refer to manufacturers' specifications.

(g) If the lifeline is left at the site of the usage, it must be inspected by a competent person on a daily basis or before each use.

(h) Portable anchorage and lifeline structural system (see Fig 6.4) should be provided to protect workers if a fixed lifeline is not available (e.g., working on top of a tank container).

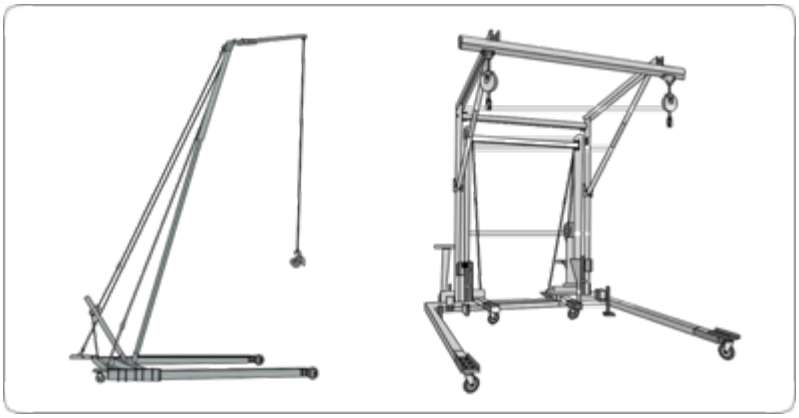


Figure 6.4: Examples of portable anchorage and lifeline structural system.

## 6.4 LIFELINE DEVICES

(a) Lifeline devices are components that link users to lifelines. They allow users to travel alongside lifelines during upwards, downwards and horizontal movements.

(b) Lifeline devices employed in fall prevention/ arrest systems include:
- Rope grabs for work positioning systems;
- Travellers for horizontal lifelines systems;
- Guided type fall arrestors for vertical lifeline systems (see Fig 6.5); and
- Ascender and descender for rope access systems.

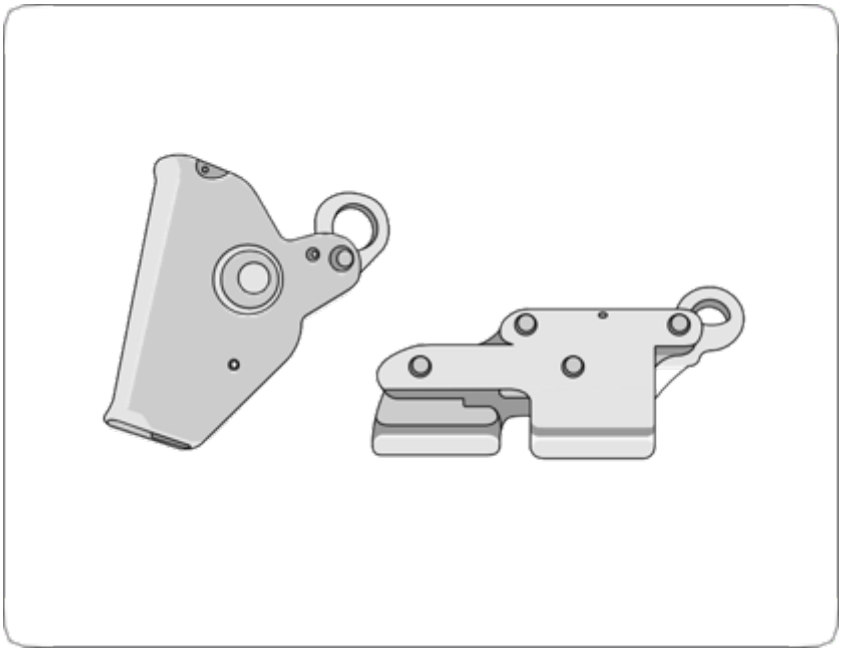


Figure 6.5: Examples of guided type fall arrestors.

(c) Lifeline devices may have direct and significant impact on the fall protection system it is being attached to. It is vital to ensure that the lifeline devices are compatible, suitable (e.g., users' ease of travelling along the lifeline), and should be certified as a system by a competent person.

## 7. TRAVEL RESTRAINT SYSTEMS

(a) The purpose of a travel restraint system is to restrict the user's movement and to prevent him from approaching an unprotected edge on a building or structure.

(b) Generally, the system consists of a safety belt or harness that is connected by a lanyard to a suitable anchorage point or a static line.

(c) The system must be set up to prevent the wearer from reaching the edge.

(d) It is critical to note that travel restraint belts are not designed for fall arrest purposes.

(e) A roof anchor may be used as a travel restraint on steel sheeting or tiled roofs during construction of the roof. It is lightweight, portable and can be installed and removed with minimal time and effort.

(f) Travel restraint systems can be used in conjunction with other fall prevention methods such as guard-rails.

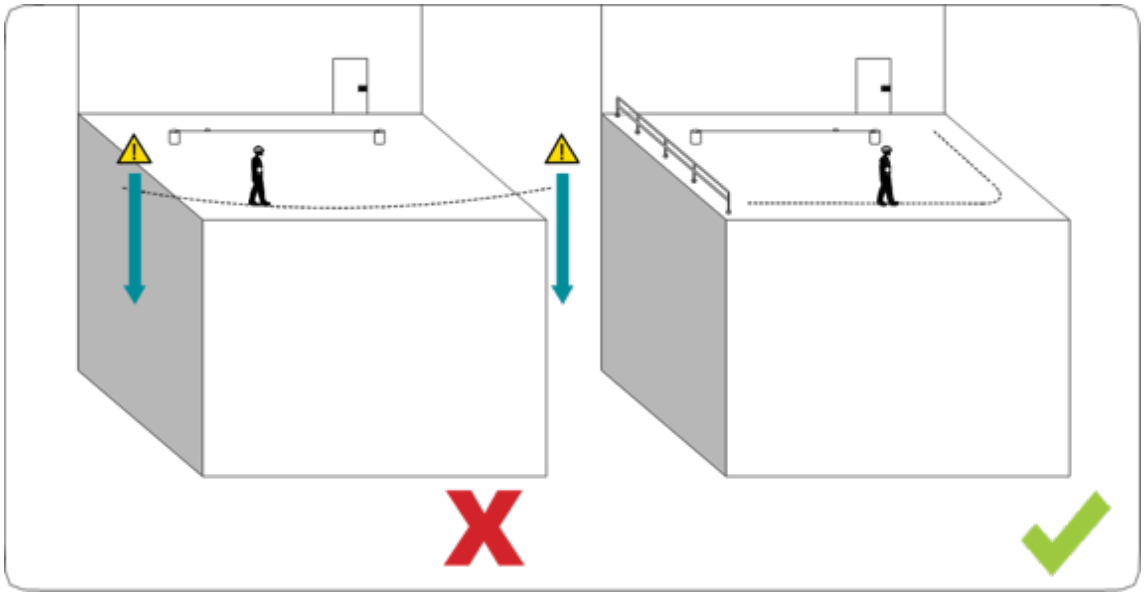


Figure 7.1: Example of incorrect use (left) and correct application (right) of a travel restraint system.

(g) Where it has been planned to use a travel restraint system, the following conditions should be complied before the system is used:

- The travel restraint system should prevent a person falling from the edge of a roof (see Fig 7.2). The system should not be used on fragile roofs; and
- Persons setting up and/ or using the system should be able to demonstrate that they have a clear and thorough understanding of the system and how the work area can be accessed without the possibility of a fall occurring.

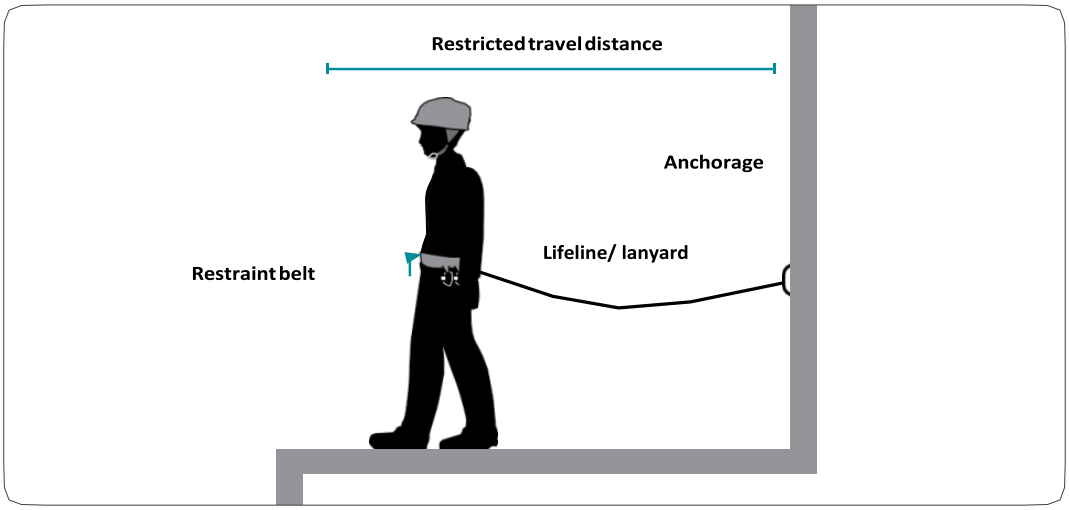



Figure 7.2 The travel restraint system prevents the user from reaching the open side.

(h) Where access to the corner of the roof is required, workers should be attached to two or more sets of ropes and anchorages to prevent a fall from either edge of the roof. While accessing the anchorage points, the users should be restrained so that a fall cannot occur.

(i) The anchorage points must be capable of withstanding at least two times the maximum total load (total weight of person and tools/ equipment) likely to be applied to it without failure.
Anchorage points should be designed for additional loading should more than one person be using the system.

(j) If the system consists of ropes that require their effective length to be adjusted to prevent a fall occurring, the method of adjusting the rope length should be by means of a lockable cam device or similar; if there is a possibility of the rope grab (or similar device) coming off the end of the rope, the rope should be suitably terminated.

(k) Restraint belts are used only for travel restraint and not for fall arrest purposes. A personal fall arrest system should be used if the intention is to provide fall arrest instead of travel restraint.

(l) Travel restraint systems are generally only suitable for work such as the following:
- Roof inspection (not on fragile roofs);
- Installation and removal of perimeter guard-rail systems;
- Routine work during temporary removal of guard-rails;
- Minor repair work, including replacement of some isolated parts of the roof;
- Painting and cleaning;
- Installations of skylights and ventilation fixtures;
- Pointing up tiles or fitting ridge capping on metal roofs; and
- Installation and removal of television aerials and other similar communication equipment.

## 8. PERSONAL / INDIVIDUAL FALL ARREST SYSTEM

### 8.1 FUNDAMENTALS OF PERSONAL FALL ARREST SYSTEMS

(a) A personal fall arrest system is a collection of components that work in conjunction to:

- Safely stop a person from falling an uncontrolled distance; and
- Reduce the impact of the fall.

In general, a complete personal fall arrest system consists of three vital components:

- Anchorages;
- Body support; and
- Connections.

It is critical to note that individually, these components will not provide protection from a fall. It is only when they are used correctly and in conjunction with each other that they will be able to arrest or sustain a fall.

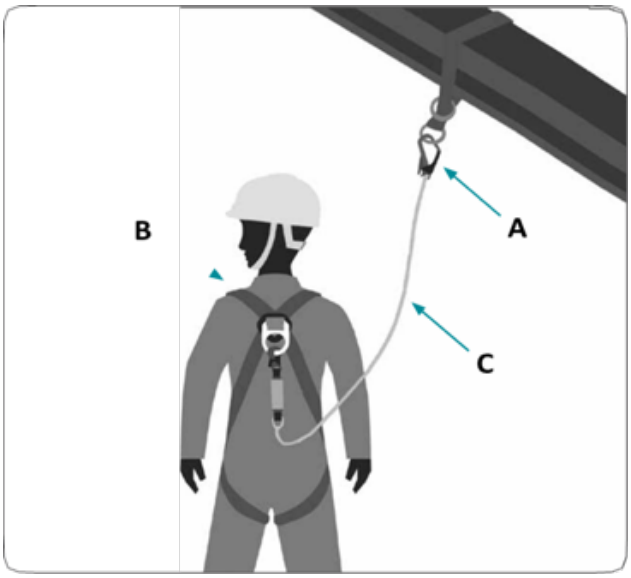



Figure 8.1: "ABC" of a personal fall arrest system –
"A": Anchorage, "B": Body Support, "C": Connection.

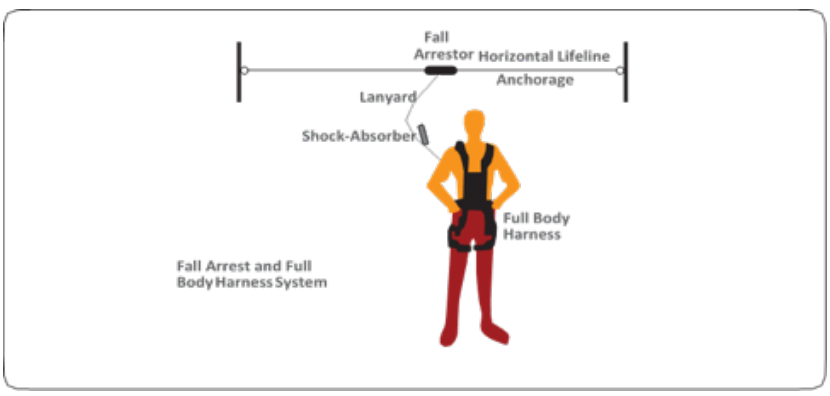



Figure 8.2 Fall arrest system with horizontal Lifeline

They can be used where workers are required to carry out their work near an unprotected edge such as rigging and dismantling. They may also be used where the working platform is not stable, for example, in suspended scaffolds.

(b) When used to arrest falls the following guidelines are to be observed:

- The system should be rigged such that if a fall occurs, the distance fallen will be the shortest. This is to minimise the impact and swing of the arrest;
- All fall protection equipment should be visually checked prior to usage;
- Once a fall arrest system has been used to arrest a fall, it must be removed from service and not used again; and
- Anchoring of lanyards to guard-rails of scaffolding should be avoided where possible.

(c) The personal fall arrest system is designed to arrest only one fall. In the event of a fall, even if the shock absorber has not been extended, all the components of the fall arrest system should be inspected and approved by a competent person or the manufacturer before it is put to use again. Otherwise, they are to be removed from service.

## 8.2 LIMITATIONS OF FALL ARREST SYSTEMS

(a) Personal fall arrest systems should only be used if it is not reasonably practicable to use other risk control measures to prevent falls. Personal fall arrest systems require a moderate level of skill to use safely, and in the event of an arrested fall, it may cause some physical injury to the user.

(b) Height clearance is another limitation of personal fall arrest systems. For a person falling from height, the combined length of the lanyard, sag in life line and the shock absorber fully extended may be more than 5m in total. This 5m might be more than the actual height of the fall; and

(c) Therefore, when working in areas where falls over short distances are possible, a short lanyard or retractable fall arrest block should be considered.

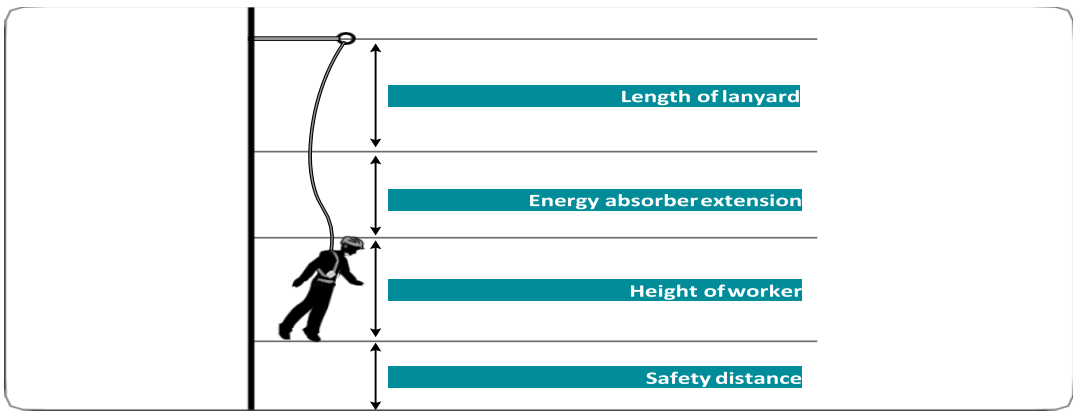



Figure 8.3: A graphical representation of the formula for calculating clearance height.

**CALCULATION OF THE FREE FALL DISTANCE**

**FREE FALL DISTANCE**

i. The allowable free fall distance for personal fall arrest systems should be limited to not more than 2 metres.

**FREE CLEARANCE DISTANCE**

i. This is known as 'free space', it is the total distance below a worker who is using a personal fall srrest system to safely arrest his fall without striking an obstruction or the ground. Below are the formulae for two commonly used configurations.

ii. For a harness, lanyard with energy absorber assembly (Fig 8.3):

- Clearance Height = Length of Lanyard + Length of Energy Absorber Extension + Height of Worker + Safety Distance ( usally taken as 3ft or 1m)
- For self Retracting Lifeline (SRL)/Retractable Fall arresters:

  Clearance Height = Deceleration Distance + Height of Worker + Safety Distance ( usually taken as 3ft or 1m)

  If the personal fall arrest system (fall arrest lanyard or SRL) is attached to a horizontal life line (HLL), the deflection of the HLL need to be included.

## 8.3 INSTRUCTION AND TRAINING FOR WORKERS USING PERSONAL FALL ARREST SYSTEMS

(a) Any person required to use a personal fall arrest system should be trained and instructed in:
- The correct fitting and attachment of safety harnesses;
- The dangers of using incompatible hardware;
- The inspection, maintenance and storage of equipment;
- The correct anchorage, installation and use of the system; and
- Emergency rescue procedures.

(b) Upon completion of the training programme, workers should be assessed for their competency in the safe use of the equipment.

## 8.4 HAZARDS OF FALL ARREST SYSTEMS

(a) There are some hazards when using personal fall arrest systems. One such hazard is "swing back" and "swing down". It is caused by the pendulum effect of a person falling off the edge.

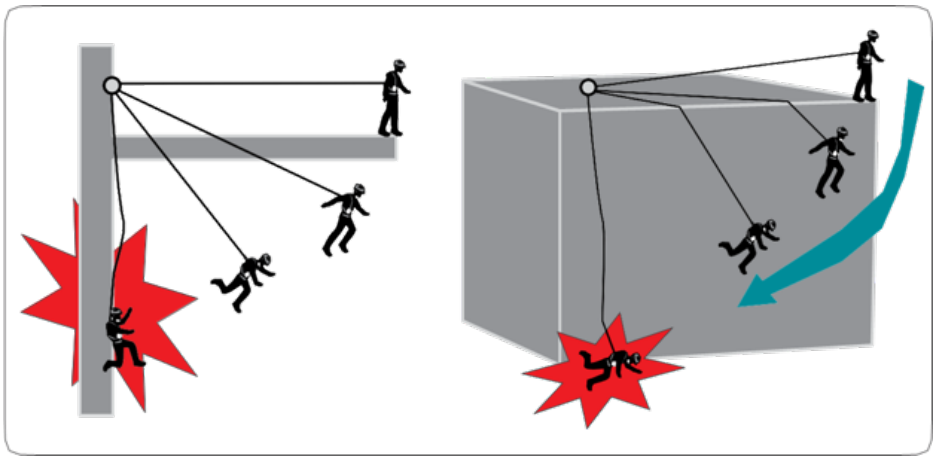


Figure 8.4: Swing back (left) and swing down (right) hazards.

(b) "Swing back" – In a fall, particularly from a perpendicular edge, the worker will swing back into the building structure and collide with any obstructions in the path of the swing (see Fig 8.4, left). If there is a risk of a swing back occurring, the use of a personal fall arrest system should be reassessed.

(c) "Swing down" – In a swing down, the arrest line extends diagonally from the anchor point, following the perimeter edge of the roof. If the worker falls, the fall arrest line will slide back along the perimeter until it is at a right angle with the edge of the roof. If the arrest line is too long, the worker will drop and hit the ground (see Fig 8.4, right) or the arrest line may break when it comes into contact with the edge of the roof and result in the worker hitting the ground.

## 8.5 RESCUE OF PERSONS USING PERSONAL FALL ARREST SYSTEMS

(a) Personal fall arrest systems should be used only if a written rescue plan is in place to ensure that persons who fall can be rescued as soon as reasonably practicable.

(b) The rescue procedure must not put the rescuers at risk. If a mobile elevated work platform is to be used for a rescue, it should be readily available at all times.

## 8.6 COMPONENTS OF A PERSONAL FALL ARREST SYSTEM

(a) In general, a personal fall arrest system consists of the following components:
- Full-body harness;
- Connectors;
- Energy absorbers; and
- Lanyards.

(b) They will require connection to a suitable anchor in order to function effectively. The inspection of the components of a personal fall arrest system should be conducted periodically to ensure that they have not exceeded the manufacturer's recommended usage life. Additionally, users should conduct a visual inspection before each use.

## 8.7 FULL BODY HARNESS

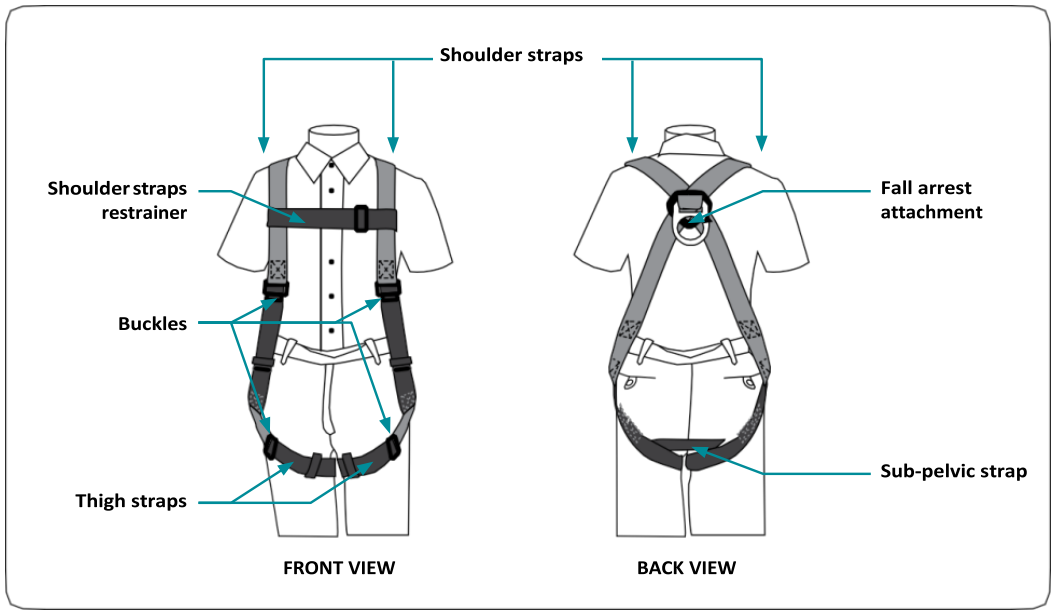



Figure 8.5: Components of a full body harness.

(a) A full body harness (Fig 8.5) is an assembly of interconnected shoulder and leg straps with or without a body belt or saddle designed to spread the load over the body and to prevent the wearer from falling out of the assembly.

(b) When doing pre-use checks for harnesses, the competent person should pay attention to the following:

- The mounting ring or the body for damage;
- Check that the activation of the fall arrest indicator and that the labels are present;
- Inside and outside of any textile attachment point loops, the competent person performing the inspection should pay particular attention to the following:
  - Cuts and frays, excessive wear and age;
  - Abrasion (furriness), particularly to load bearing parts;
  - Stitching (unauthorised repair);
  - Discoloration (sign of chemical or UV damage);
  - Powdery surface (damage by chemicals);
  - Hardening or stiffness;
  - Heat glazing or burns (damage by heat);
  - Dirt, oil, grease;
  - Flattening or thinning; and
  - Lumps.
- Fastening and adjustment buckles as well as any other safety critical metal and plastic parts for:
  - Correct assembly;
  - Correct functioning;
  - Excessive wear;
  - Corrosion; and
  - Cracks.

## 8.8 CONNECTORS

(a) Connectors are components that link other components of a personal fall protection system together (e.g., connecting a full body harness to a lanyard, connecting a lanyard to an anchorage). Connectors have a closure function to protect against inadvertent opening (see Fig 8.6).

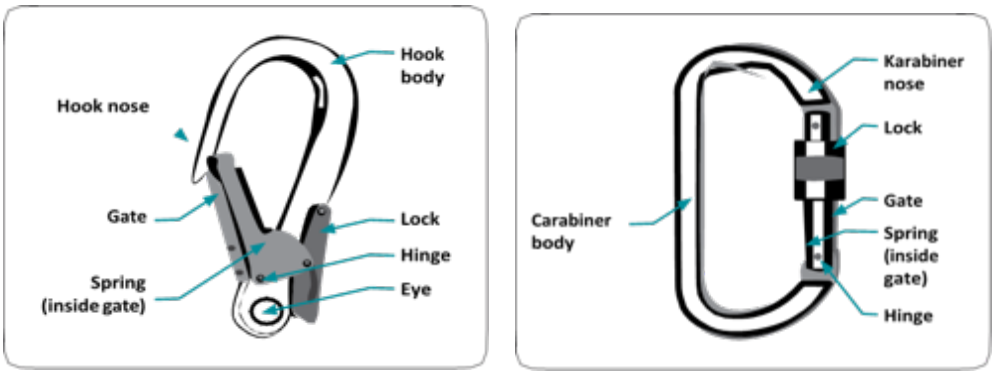



Figure 8.6: A diagram of a self-locking connector or snaphook (left) and a karabiner (right).

(b) It is critical to ensure that connectors selected are compatible with other components of a fall protection system. It is critical to note that connectors, when applied in an improper manner, may fail to perform its intended purpose in the event of a fall (see Fig 8.7).

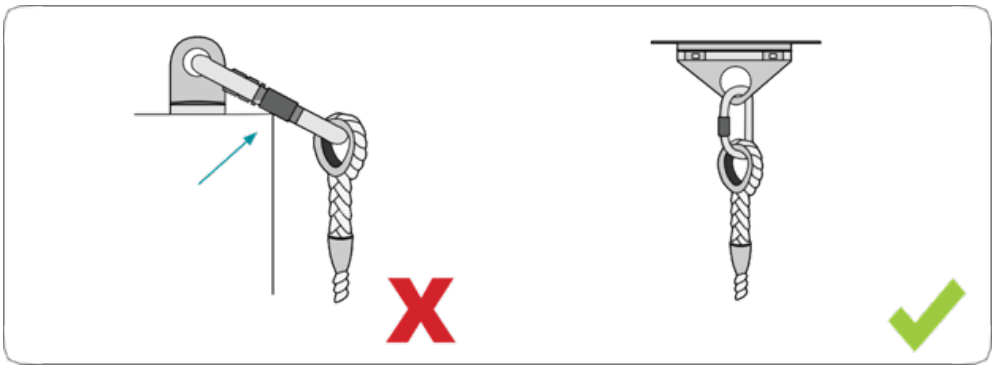


Figure 8.7: Example of incorrect application (left)
and proper application (right) of a connector to an anchor point.

(c) When doing pre-use checks for connectors, such as snaphooks, the competent person performing the inspection should take note of:

- Obvious damage or deformations (bent, twisted, corroded, worn, cracks, etc.), especially at contact points;
- Rust or corrosion;
- Contamination by chemicals (pitting or flaking);
- Build up of foreign matter (grit, grease or paint);
- Cuts, serrations, burring, heavy marking or scoring;
- Hinge pin (ensure that it is in good condition);
- Catch pin (ensure that it is not bent); and
- Functionality of moving parts such as locking mechanisms, they should open and close as intended.

## 8.9 ENERGY ABSORBER

(a) An energy absorber is a component designed to limit the arresting forces applied to the user in the event of a fall (see Fig 8.8). Energy absorbers shall be fitted correctly as per manufacturers' specifications. Failure to do so may result in the energy absorber not deploying correctly in the event of a fall. The energy absorber may be a separate item or manufactured into the lanyard.

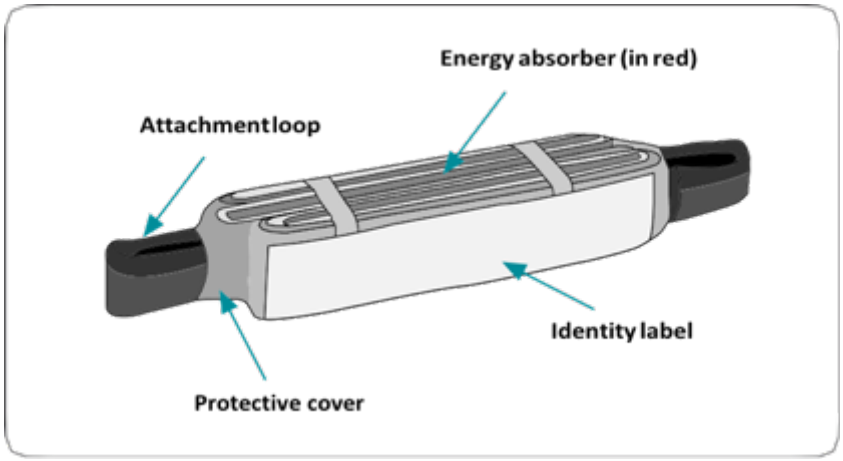



Figure 8.8: Main components of an energy absorber.

(b) An energy absorber shall have protective coverings to shield it against damage (e.g., exposure to chemicals, sharp objects and so on, that may impair its designed purpose).

(c) Energy absorbers can only be used for a period of time from the date the equipment is put to use as per the manufacturers' specifications. After the recommended period, the energy absorber must be withdrawn from use and destroyed to prevent misuse.

(d) When doing pre-use checks for shock absorbers, the competent person should take note of:
- Signs of activation; and
- Wear and tear of point of attachment.

## 8.10 LANYARD

(a) A lanyard is a finished length of flexible material which is often used in conjunction with an energy absorber (see Fig 8.9). There also exist lanyards with built-in energy absorption capabilities. A lanyard is used to connect a fall arrest harness to an anchorage point or static line. A lanyard assembly should be as short as reasonably practicable.

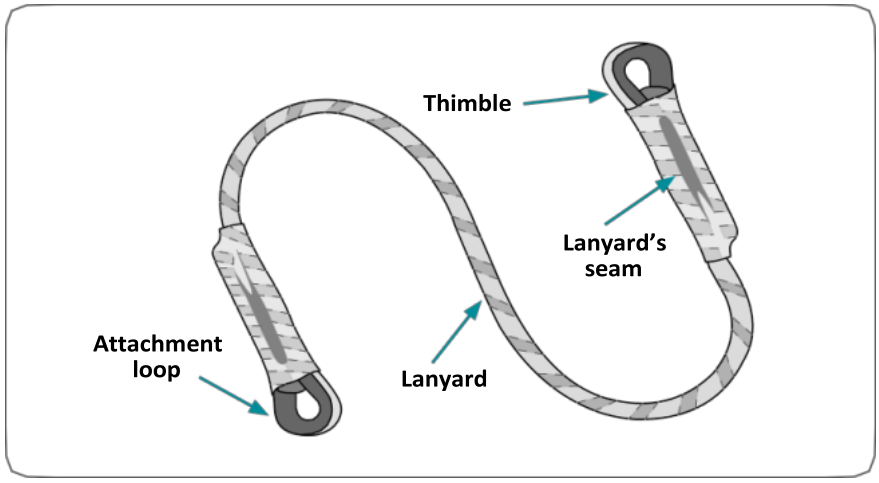



Figure 8.9: Main components of a lanyard.

(b) An adjustable lanyard is a lanyard that incorporates a designed mechanism that allows its length to be shortened or lengthened (see Fig 8.10). This mechanism is useful in situations where work restraint and anchor points at varying heights are needed.

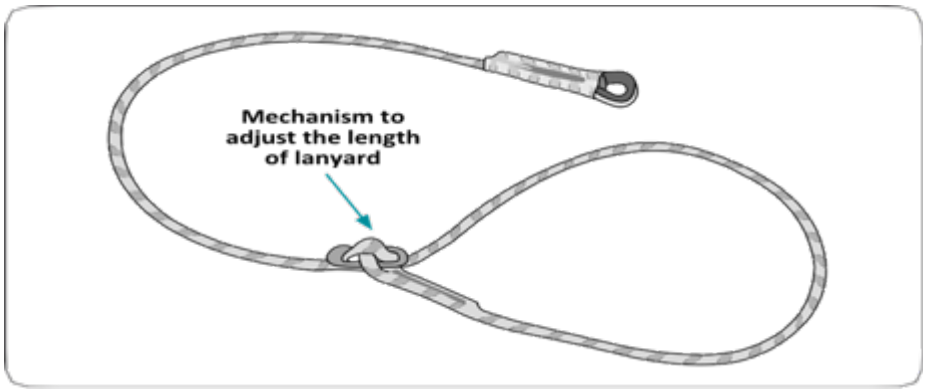



Figure 8.10: An adjustable lanyard.

(c) Twin lanyards systems or twin-tailed lanyards allow users to remain protected while transferring from anchorage point to another (see Fig 8.11). This is also known as 100 percent tie off.

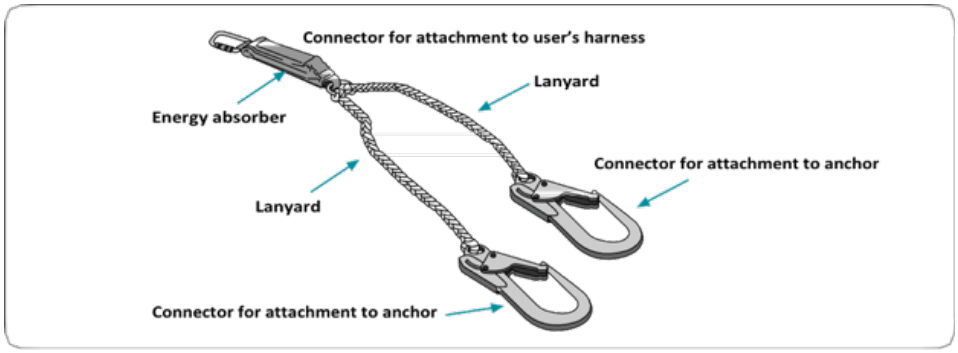



Figure 8.11: Components of a twin lanyard system.

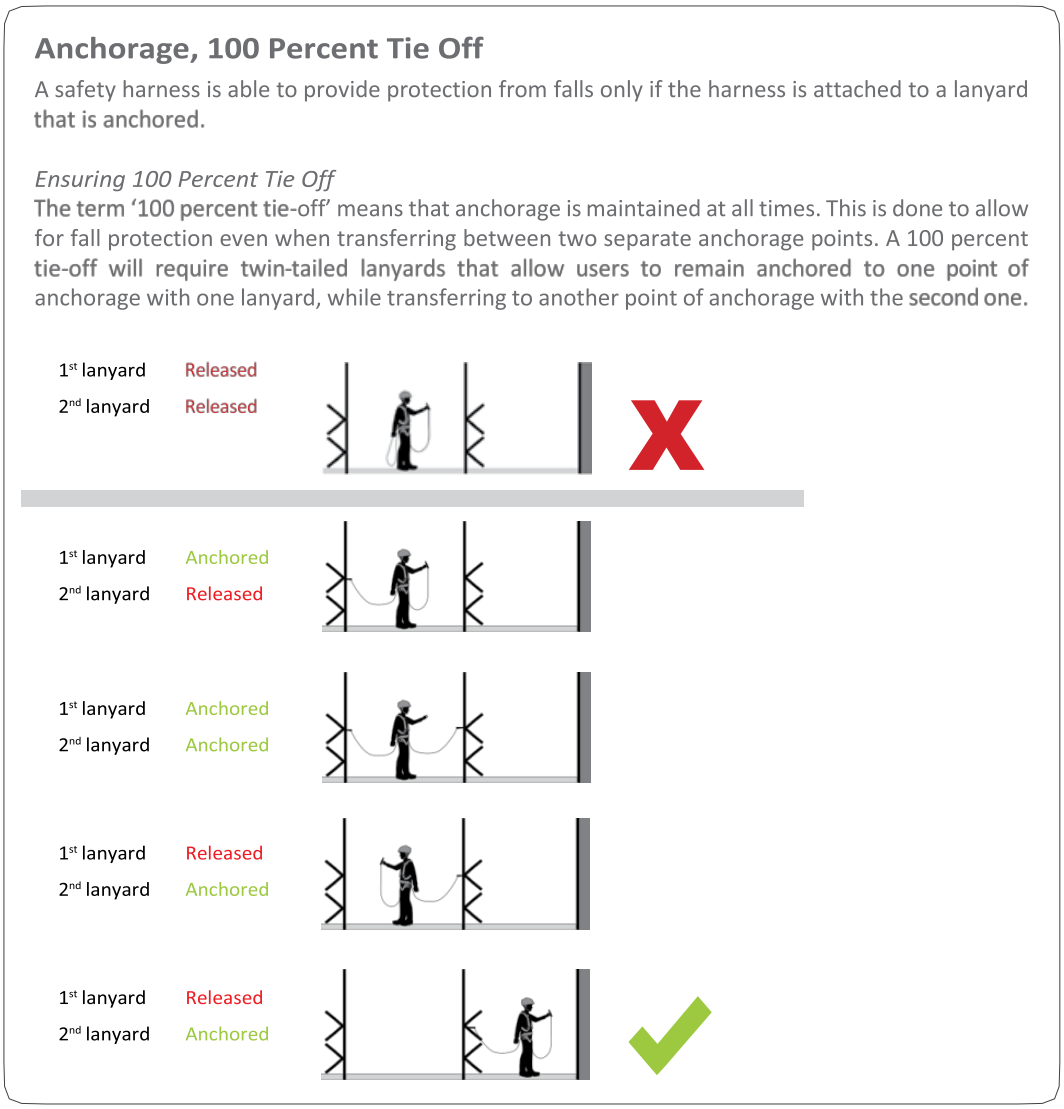



Figure 8.12: 100 percent tie off allows the person fall protection throughout the transfer of anchorage.

(d) When doing pre-use checks for lanyards and flexible anchorage lines (textile based equipment), the competent person performing the inspection should pay particular attention to the following:

- Cuts and frays;
- Excessive wear;
- Abrasion (furriness), particularly to load bearing parts;
- Stitching (unauthorised repair);
- Discoloration (sign of chemical or UV damage);
- Powdery surface (damage by chemicals);
- Hardening or stiffness;
- Heat glazing or burns (damage by heat);
- Dirt, oil, grease;
- Age;
- Flattening or thinning; and
- Lumps.

## 8.11 OTHER PERSONAL PROTECTIVE EQUIPMENT (PPE)

In addition to the abovementioned specific PPE for persons working at heights, the following could be considered:

- Suitable footwear to prevent slips;
- Gloves to provide protection against abrasive materials and chemicals;
- Eye protection such as sunglasses to ensure that a worker at height is not at risk due to glare or reflection; and
- Safety helmets that will remain in place in the event of a fall.

# 9. WORK POSITIONING SYSTEMS

## 9.1 WORK POSITIONING BELTS

(a) A work positioning belt is a form of body support that works in tension or suspension to keep a person at an elevation with both hands free to perform a job (see Fig 9.1). It is critical to note that work positioning belts are not designed to arrest a fall.

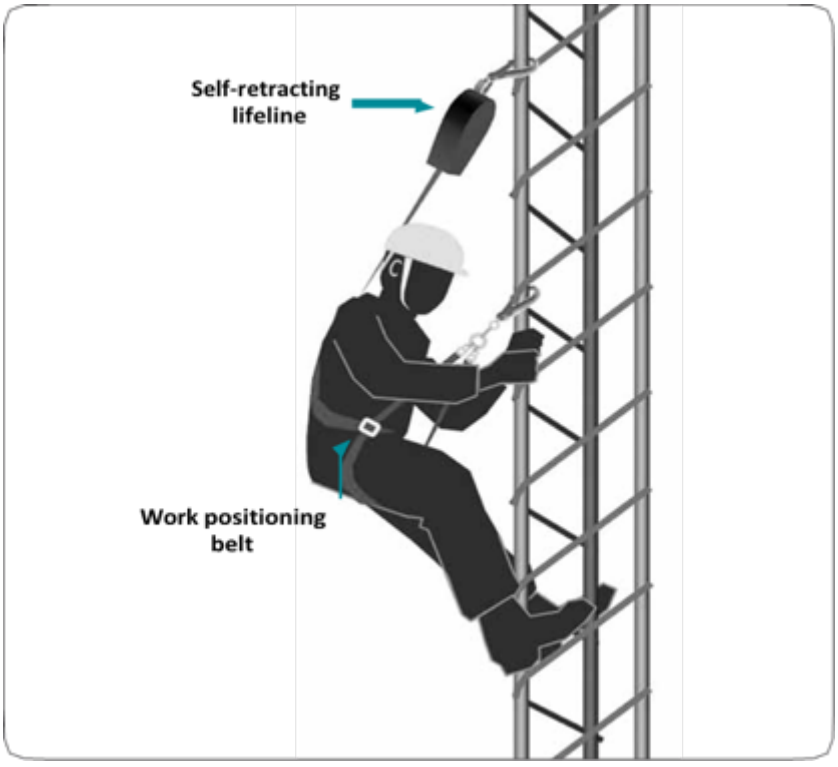



Figure 9.1: An example of a worker using work positioning belt.

(b) Work positioning should be considered only if it is not possible to employ other safer means to access the work at heights. All persons assigned to use work positioning systems must be competent and use the system only as intended by manufacturers' specifications. Examples of tasks where work positioning may be considered include access and working on monopoles, towers and antennas.

(c) A work positioning belt is linked to an anchorage using a work positioning lanyard. An independent lifeline should be attached to protect the person at work in an inadvertent fall.

(d) It is critical to ensure that all components selected are compatible as a work positioning system. Always consult the manufacturer and have the work positioning system inspected as a system, and not as individual components, by a competent person.

## 9.2 INDUSTRIAL ROPE ACCESS SYSTEMS

(a) Industrial rope access systems are used for gaining access to work areas that are hard to reach by other means, usually through the use of vertically suspended ropes (see Fig 9.2). Rope access systems require a high level of competency from the users and therefore, other means such as MEWPs and suspended scaffolds, which require less skill to operate, should be used if it is reasonably practicable to do so.

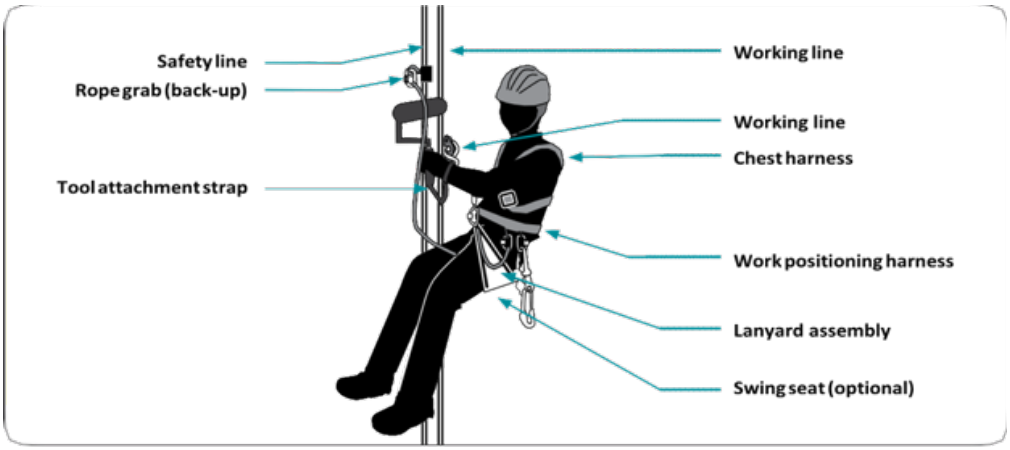



Figure 9.2: Operator using an industrial rope access system, the backup device has to be maintained at a higher elevation in relation to the operator.

(b) Industrial rope access systems are a specialised and job specific form of abseiling. The system is designed to access areas for work such as window-cleaning, sign maintenance on high rise buildings and other forms of maintenance where it is not reasonably practicable to use other forms of access. Such systems are usually suited for light or medium work but may be adapted for heavier work, such as derrick erection in shipyards through the use of lightweight suspended scaffolds for firmer footing.

(c) An industrial rope access system can be extremely dangerous if used by an inexperienced or untrained user or if used in an improper manner. To ensure safety during industrial rope access system operations, it is critical to address at least the following key elements:

- Hazards Identification and Risk Assessment;
- Competency;
- Rope access equipment; and
- Safe Work Procedures

## 9.3 HAZARD IDENTIFICATION AND RISK ASSESSMENT

(a) Rope access should only be employed after due consideration has been given to assess that it is a suitable method and that all control measures are in place to allow the work to be carried out safely.

(b) A comprehensive hazard identification and risk assessment ensure that risks are minimised, by addressing (but not limited to) the following:

- Team structure – levels of rope access, supervision, and so on;
- Competency;
- Selection of tool and equipment;
- Inspection and maintenance; and
- Safe Work Procedure's communication, permit-to-work system, and so on.

## 9.4 COMPETENCY

(a) All persons assigned to perform rope access works must be competent in working at heights, in addition to having undergone structured and documented rope access training. Rope access personnel should be competent in the level of responsibility assigned to them (e.g., workers being able to conduct self- rescue, supervisors being able to supervise and ensure a rope access team works safely).

(b) Rope access team size must be assessed and established for each work situation. Each team should consist of at least two members, one of them must be a trained and competent rope access supervisor. Rope access personnel must not work alone in case assistance is required in an emergency.

## 9.5 ROPE ACCESS EQUIPMENT

(a) The equipment used can be determined through the risk assessment process, which must be carried out before each task. Equipment selected must be suitable and adequate for industrial rope access, and be compatible as a system. Always consult the equipment manufacturers and use the equipment in accordance to the manufacturers' user instructions.

(b) All load-bearing rope access equipment or components should be marked with a unique identifier to ensure equipment traceability. Equipment that is withdrawn from service must not be used without the inspection and approval by a competent person. Defective equipment should be destroyed and dispose of to prevent misuse.

(c) Records of equipment usage, inspection and maintenance should be kept. Equipment should be routinely and thoroughly inspected by a competent person. Equipment should also be inspected by user prior to each use; user inspections can be structured using a checklist.

(d) After usage, equipment should be cleaned and dried or otherwise prepared for storage. Equipment should be stored in a cool, dark and dry location that is chemically neutral and not in close proximity to any objects or substances that may damage them.

## 9.6 SAFE WORK PROCEDURES

(a) An industrial rope access system should be configured and used in a manner to protect persons from falls. One of the key elements includes having two independently anchored ropes for each person. It is critical to note that an industrial rope access system is not designed to stop or sustain falls, unless designed so by a competent person.

(b) Work should start from areas safe from falling risks, or made safe with fall prevention control measures (e.g., edge protection). The rope access system should only be installed in locations where it is possible to provide prompt assistance and rescue if necessary.

(c) Safe Work Procedures or methods should be clearly understood by all persons. The supervisor should ensure that there is adequate and effective means of communication between all team members.

(d) The risks of falling objects must also be mitigated. Small tools should be secured to the person using lanyards. It is important to note that the combined weight of all items carried must be within the safety factor of the rope access system.

(e) Persons using rope access should be provided adequate rest periods, taking into consideration the adverse effects of weather, working at altitude (e.g., high wind speeds) and their difficult work positions.

# 10. LADDERS AND STEP PLATFORMS

## 10.1 SAFETY GUIDELINES FOR LADDERS

(a) Ladders can be broadly categorised as fixed ladders and portable ladders:
- A fixed ladder is an integral part of a building or structure, and cannot be readily moved or carried.
- Portable ladders are ladders that are designed to be mobile and can be carried and deployed at various locations. The two main categories of portable ladders are step ladders and vertical access ladders.

(b) Observe the following safety guidelines when using ladders:
- Do not use ladders that are of poor construction, unsound material or are of inadequate strength;
- Do not use ladders where a person or ladder may make contact with power lines. Do not use ladders that contain metal near live electrical equipment;
- Do not set up ladders in passageways, doorways, driveways or other places where a person, vehicle or crane lifted load can hit it;
- Do not use ladders near the edge of an open floor or on scaffolding to gain extra height; if a ladder topples in such a situation, the worker could fall over the edge;
- Do not work on ladders continuously for extended periods of time (maximum recommended time: 10-15 mins);
- Do not overreach – ensure that body stays within the stiles and keep both feet on the same rung throughout the task;
- Do not use the ladder unless slip resistant footwear is being worn; and/ or

- Do not carry materials and tools by hand when ascending or descending the ladder. Persons on ladders should maintain three points of contact at all times (see Fig. 10.1).

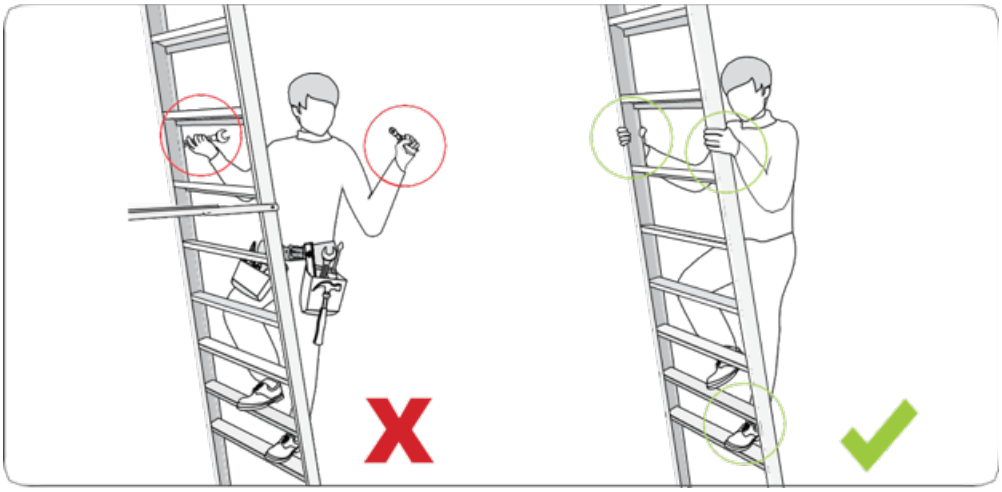


Figure 10.1: Tools and materials should not be carried by hand and should be in a tool belt or side pouch (left). Three points of contact with the ladder should be maintained at all times (right).

(c) Requirements for ladders:

- Must be in good condition
- Must be securely footed by a helper, or fixed near to the top or, if this is impracticable, near to the bottom to prevent undue swaying
- Must be set on a firm level footing (not bricks)
- Must extend at least 1.05m above the landing place, unless another suitable hand hold is provided
- There must be sufficient clear space at each rung to allow a safe foothold
- The vertical run of the ladders should not exceed 9m, unless an intermediate landing has been provided
- The ladder must be set at the correct angle, approximately 75o – one measure out for every four measures up
- The ladder must not be tied to any object which may be insecure (e.g. a drain pipe)

(d) Do not use ladders with any of the following faults:

- Metal stiles which are corroded, twisted, bent, kinked, crushed, or with crack welds or damaged feet;
- Rungs, steps, treads or top plates which are missing, worn or loose;
- Missing, broken or loose tie rods; and
- Missing, broken or worn ropes, braces or brackets.

(e) Ladders can be checked for serviceability by;

- Taking each end of the ladder in turn and trying to push the stiles apart and then together. Any movement indicates insecure rungs or loose tie rods;
- Laying the ladder flat, raising one end and attempting to push one stile while pulling the other. If the stiles move relative to each other, the rungs are loose; and
- Ladders should be inspected routinely to ensure that they are in good condition.

(f) Fall prevention measures in association with the use of ladders should be in place if the risk assessment shows that additional protection is necessary (e.g., ladder lashing).

(g) Alternative safe means of access and work platform (example of a step platform shown in Fig 10.2) should be provided if the risk assessment shows that usage of ladder may be unsafe for the duration or height of the task.

Figure 10.2: A step platform can provide a more stable work surface.

## 10.2 Portable Ladders

### STEP LADDERS

(a) Step ladders, commonly known as A-frame ladders, in general should not be used for access to another level unless they are designed for the purpose as specified by the manufacturer. Ladders used for access to another level must be properly secured.

(b) Step and trestle ladders should only be used when they are in the fully open position.

(c) Standing on top of a step ladder (see Fig 10.3, left) is highly unsafe and should never be done. If it is necessary to work from a step ladder, work a few steps below the top rung, so that a handhold can be maintained.

(d) Ensure that both spreaders are locked firmly in the open position.

(e) Avoid work that imposes side loading. If side loading cannot be avoided, ladder must be proper secured using tie backs or other suitable means.

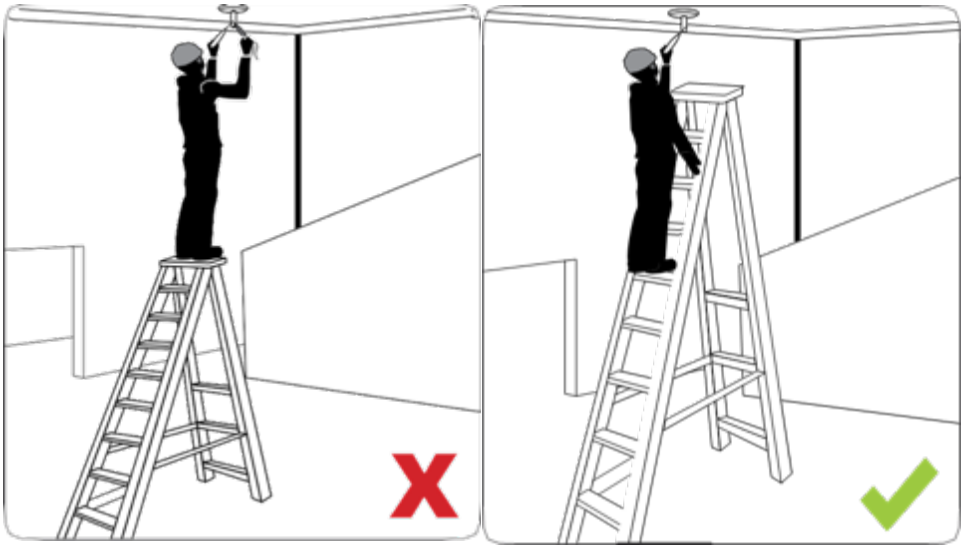


Figure 10.3: If it is necessary to work on a step ladder,
work a few steps below the top rung, so that a handhold can be maintained.

## 10.3 VERTICAL ACCESS LADDERS

a) Ladders leaning against a supporting structure should be set up on a level area on firm footing and the base should be located a distance from the wall approximately a quarter of the vertical height of the ladder (see Fig 10.4).

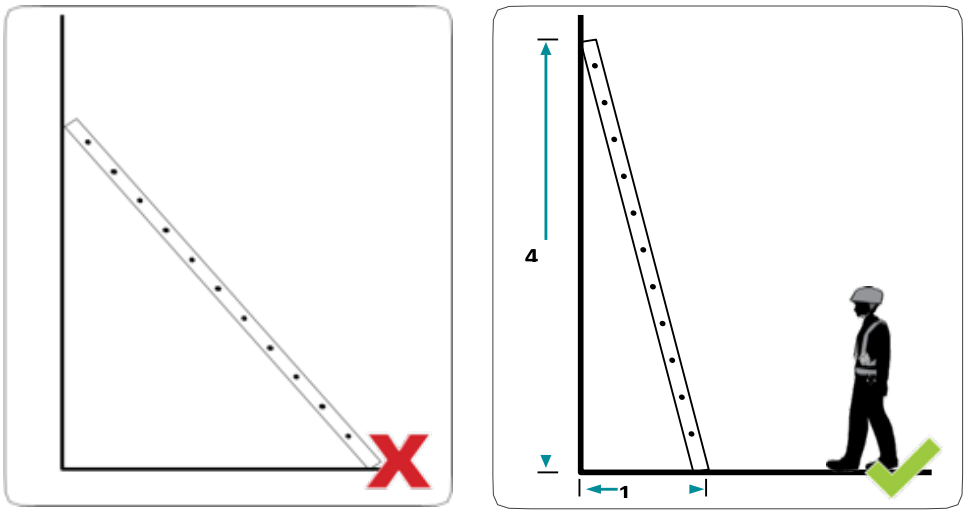



Figure 10.4: The ratio of the height to the base for a correctly positioned ladder is 4:1.

b) Where a ladder is used as a means of access or as a working place, adequate handholds should be provided to a height of at least one meter above the place of landing of the highest rung to be reached by the feet of any person working on the ladder.

c) When securing a ladder:
- Ensure that the ladder is on firm ground or the user can spread the load, for example, by placing a board at the bottom of the ladder;
- Tie the ladder to a suitable point making sure that both stiles are tied (see Fig 10.5).

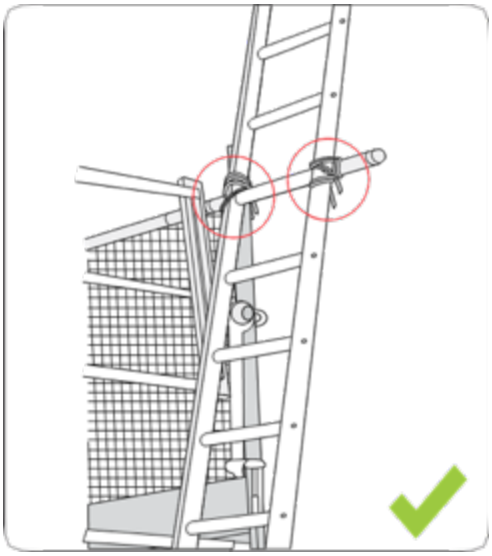


Figure 10.5: An access ladder with secure handhold and both stiles tied.

## 10.4 FIXED LADDERS

(a) A fixed ladder used to provide access to another level must provide adequate handhold at the landing (e.g., the ladder rising at least 1 metre above the landing).

(b) For fixed ladders that rise a vertical distance of more than 3 metres, additional fall prevention measures shall be considered (e.g., installation of a safety cage shown in Fig 10.6).

(c) For fixed ladders that rise a vertical distance of more than 9 metres, an intermediate landing shall be provided to reduce the distance between landings; such landings need to be effectively barricaded to prevent falls.

(d) A risk assessment shall be conducted to determine if additional fall prevention measures associated with the use of fixed ladders are required (e.g., installation of a vertical life line).

(e) Access to and usage of fixed ladders should be controlled (e.g., locking the base of the safety cage to prevent unauthorised access) such that only persons who are competent and have work duties should access them.

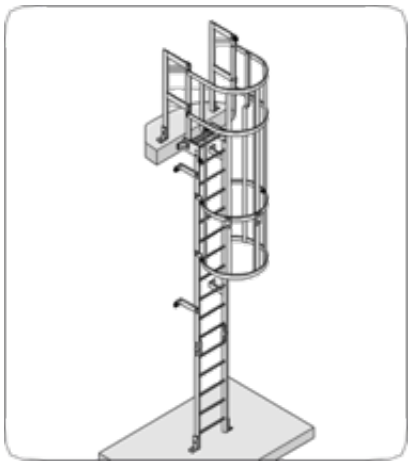


Figure 10.6: A fixed ladder with safety cage installed and a secure handhold at the landing.

# 11. HAZARDS OF WORKING ON ROOFTOPS

## 11.1 WORKING ON ROOFTOPS

(a) Works on rooftops are potentially hazardous work at heights; due consideration should be given to eliminate the need for persons to work on rooftops (e.g., working from bottom of roof, providing alternative work platforms like scaffolds or MEWPs).

(b) There are many potential fall hazards when working on rooftops that include:
- Falling over an unprotected edge (e.g., open side at roof access point);
- Falling through a fragile roof surface (e.g., skylight, corroded roof sheets);
- Falling through openings on roofs (e.g., incomplete roofing, roof hatches); and
- Slips and falls off pitched roofs (e.g., wet or smooth pitched tile roofs).

(c) It is critical to ensure that all persons assigned to perform works on rooftops are competent. If introducing inexperienced workers, ensure that they have undergone formal training and fully understand the hazards and the fall control measures before they go onto a roof. Inexperienced workers should work in areas where the supervisor can see and communicate with them at all times.

## 11.2 WORKING ON PITCHED ROOFS

(a) Any person working on a pitched roof, or is required to access a pitched roof in the course of his work shall be protected at all times against any sliding or falling from the roof.

(b) Persons should not walk or work directly on tiles or slates unless additional fall control measures are in place.

(c) Suitable and adequate fall control measures shall be considered. This includes, and is not limited to:
- Installation of temporary edge protection, for example, guard-rails, scaffold edge fall protection (see Fig 11.1);
- Installation of proper access to work areas, for example, roof ladders, gangway (see Fig 11.2);
- Installation of proper work platform to provide persons with a flat work platform on an inclined roof, for example, roof brackets;
- Personal fall prevention system that allows persons to access their work areas while utilising 100 percent tie off (see Fig 11.3); and
- Other measures that can be effectively deployed to reduce the distance of a potential fall, for example, safety net.

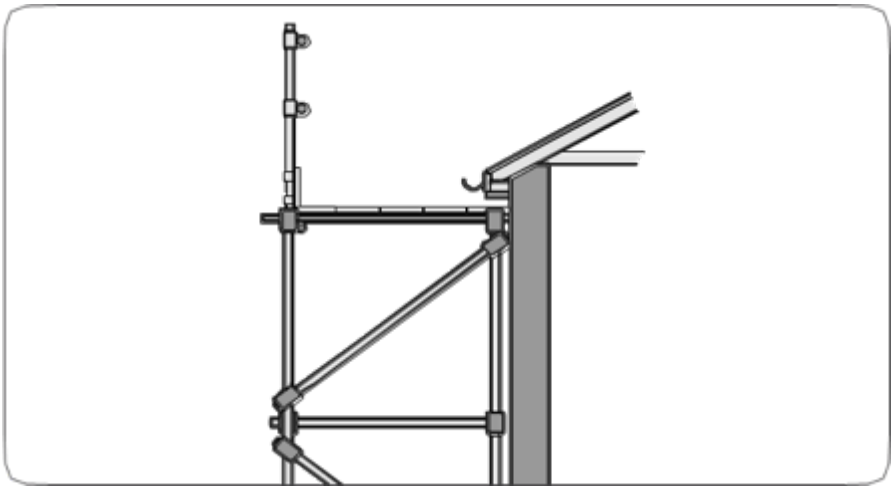


Figure 11.1: Typical pitched roof scaffold edge protection.

Figure 11.2: Crawler boards, gangways and perimeter guard- rails can enhance safety for work on pitched roofs.

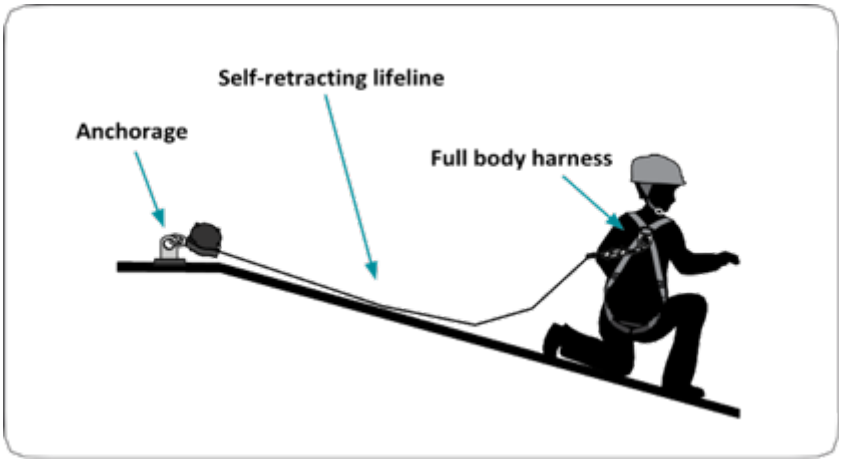



Figure 11.3: An example of personal fall arrest system for roof works.

## 11.3 WORKING ON FRAGILE ROOFS

(a) Fragile roof surfaces refer to parts of the roof that are not designed to bear load; thus, persons standing on fragile and brittle roofs are at risk if the roofs break and give way under the loading of the persons' weight. These roofs typically include those that are constructed from moulded or fabricated materials such as cellulose cement roof sheets, glass, fibreglass, acrylic or other similar synthetic materials.

(b) Some materials may become fragile eventually due to wear and damages may lead to early failure or the sheets and fixings have reached the end of their usability period. All roofs should be treated as fragile until a competent person has confirmed they are not.

(c) Fragile roofs should be identified and clearly communicated to any persons accessing the roof. In addition, the following information should be made available to any persons, including contractors that may access the fragile roofs:

- The material type of the existing roof;
- The age of the existing roof;
- Any previous modifications to the roof;
- Any repairs carried out in the past (e.g., partial repair using "patching");
- Any parts where the material could be of different properties (e.g., skylights);
- Any existing safe access methods to the roof; and
- Any areas where access is prohibited.

(d) Never Walk Unprotected on Fragile Roofs

(e) The assumption that it is safe to walk along the line of the roof bolts above the purlins must never be made.

- Some roofing sheets may fail to provide adequate support for a person near the purlin as it provides an edge to tear the sheet;
- Previous modifications may result in overlapping and bolting that do not coincide with any purlin – these appear safe but in fact, there is no support underneath it; and
- Any additional load, for example, an inadvertent stumble, may cause the roof to fail instantly.

Hence, it is critical to ensure that all persons exposed to falling hazards on a fragile roof are able to utilise 100 percent tie off at all times.

(f) If a person is required to work on or from a roof that is fragile and can break easily, it is important to ensure that:

- Before the roofing work is carried out, the brittle or fragile areas are identified and the stability of the structure and soundness of the roof is assessed as part of the risk management process;
- The worker is informed that it is a fragile or brittle roofing;
- Safe access to the work area is provided to enable workers to step directly onto a safe platform or area (e.g., using crawler boards);
- Work is carried out from a working platform that is located and constructed to allow work to be performed safely (see Fig 11.4);
- An adequate fall arrest system is installed and used;
- There is another person present at all times when work is being performed on a brittle roof in case there is an emergency;

- Training and instruction have been provided to workers on precautions to be taken;
- Warning signs are displayed at access points to any work area where fragile material is present (see Fig 11.5); and
- Other measures that can be effectively deployed to reduce the distance of a potential fall, for example, safety net.

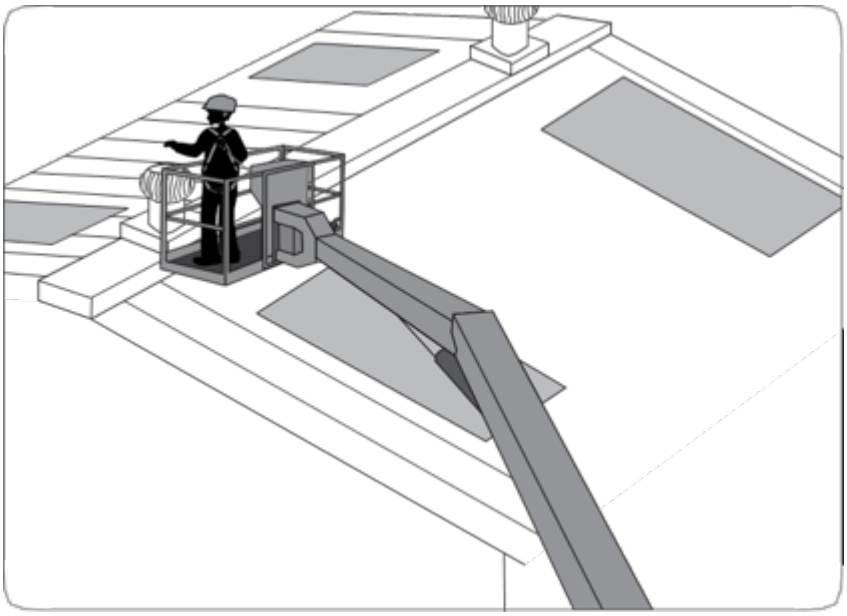


Figure 11.4: Use of MEWP to eliminate the need for workers to stand on fragile roof surfaces.


Figure 11.5: Warning signs to be fixed at points of access to fragile roofs

## 12. RESIDUAL RISKS

(a) Residual risks are the remaining risks after implementation of risk controls. The risk assessment team should ensure that residual risks are acceptable and manageable; and highlight the residual risks of each of the controls.

For example, if the risk control involves the use of safety harnesses and lanyards (a type of PPE), one of the residual risks is that the workers may not anchor the lanyards to protect themselves. In this case, the risk assessment team can highlight training (administrative control) as a further measure to ensure that residual risks are further minimised.

(b) Once all the risk controls are selected and their residual risks highlighted, the risk assessment team needs to identify the officers for action and follow-up dates. In this way, the specific officers to implement the controls can be clearly identified, and the follow-up dates help to ensure timeliness in implementation.

## 13. INFORMATION, INSTRUCTION AND TRAINING

(a) Information, instruction and training should be given to provide your employees with the skills and knowledge they need to perform work at height safely.

(b) For example, an individual fall arrest system requires a high level of competency on the part of the user to ensure its proper usage. Employees who use these systems should be trained in the correct fitting, anchorage, use and maintenance of the individual fall arrest system, including the nature of the fall hazard and the risks of injury associated with the tasks that they undertake when using the individual fall arrest system. This training should cover the risks of injury associated with an arrested fall.

(c) Induction training should be provided for all new workers. It is a good idea to keep a record of training to enable ongoing programme evaluation and review. Information should be provided in a form that can be understood by all workers. This may include providing information in languages other than English.

## 14. TIPS TO REDUCE THE RISK OF FALLING FROM HEIGHT

(a) Discourage unsafe practices

Unsafe practices among workers should never be condoned by the management. Should the management decide to disregard unsafe practices such as not wearing the individual fall arrest system when require, workers may be led to believe that it is acceptable to engage in such practices. Over time, these unsafe practices may be unofficially incorporated into the work procedures, making it a norm. This will increase the risk faced by workers working at height.

(b) Supervision of work

The supervision of work is important and should be carried out by an appointed and qualified supervisor. Without proper supervision, workers may violate rules and regulations or adopt unsafe practices and put themselves at risk.

(c) Supervisors should ensure that workers adhere to all the safety requirements such as using their individual fall arrest system correctly. They should also be trained to spot and identify any unsafe work practices among workers.

(d) A buddy system should be encouraged in your company so that workers can help to remind and encourage each other on the safe work practices even in the absence of a supervisor.

(e) Wear the fall arrest system safely and correctly
Workers should use safety equipment properly despite the discomfort and inconvenience that may arise from the use of the safety equipment (most commonly the individual fall arrest system). One common reason for misuse is that by anchoring their individual fall arrest system, it may hinder them from doing their work due to restricted movement. Hence, for convenience, they may choose not to anchor. Such undesired practices can also be due to the lack of knowledge on the danger of their work and the importance of the individual fall arrest system.

(f) Proper use of equipment
Some incidents were caused by workers using uncertified equipment or equipment that had yet to be approved. One common example was the use of scaffolds that have not been certified safe. Scaffolds that are safe for use carry a green tag.

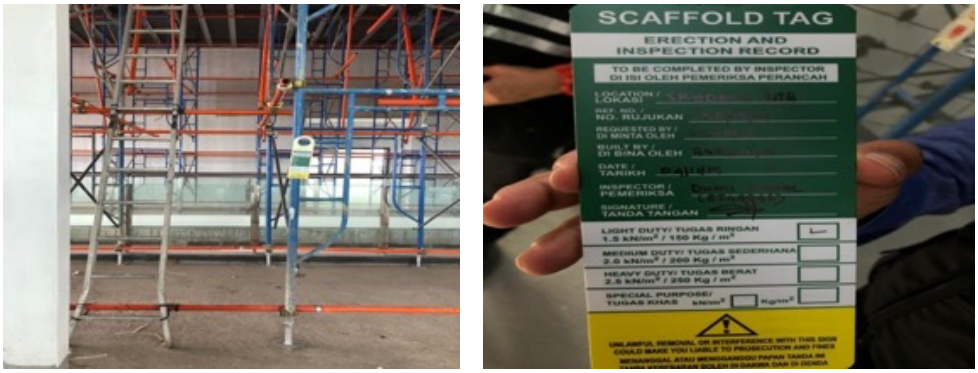



Figure 14.1 Scaffolds have to be certified and tagged as safe before use.

(g) Attention should also be given to ensure that the equipment is not being misused such as using a safety barricade as a ladder to gain access to higher areas. Misusing equipment poses a significant risk as they are not designed to carry out the intended functions.

(h) Safe route of access
One common unsafe practice noticed was the frequent use of unauthorised and often unsafe routes of access in order to hasten work. Such shortcuts should not be allowed and workers should be reminded to use the identified safe means of access.

## 15. WORKING OVER WATER

Where there is a risk of persons falling from a structure into water, a secure form of fencing or barrier must be provided. This can be removed for access and movement of materials, but must be replaced as soon as possible.

Other points to be considered are:

- Safety nets, if used, must be properly erected

- Warning notices must be placed near to all edges
- Adequate lighting must be proved as necessary
- Buoyancy aids must be provided as necessary and worn by all operatives involved in working over water
- Suitable rescue equipment must be provided and maintained
- Frequent checks must be carried out to ensure that the correct number of personnel can be accounted for
- All persons are to work in pairs, or in larger groups as necessary
- All persons must be trained in the procedures for raising alarms and in rescue drills.

## 16. SAFETY NETS, BELTS AND HARNESSES

Safety nets, belts and harnesses must be used where it is impracticable to provide standard working platforms with guardrails and toe boards. Even when safety nets are installed, every effort must be made to provide a working platform above the net.

### 16.1 SAFETY NETS

(a) Safety nets should be erected as close as possible to the working level and, if on the outside of the structure, should be higher at the outer edges that at the inner.

(b) Safety nets are intended to save lives and prevent injury; they are not meant to catch unwanted rubbish.
There are two main types of safety net:
- Personnel nets. 100mm mesh. Intended to catch a man falling from above.
- Materials or debris protection nets. Smaller mesh 12mm – 19mm, intended to protect those below from falling objects.

(c) Size and setting of the net are of critical importance; the further a person may fall, the larger the net needs to be. The maximum recommended distance a person should fall before encountering a net is 6m.

(d) Where a fall of one metre is possible, the net must have a horizontal projection beyond the outermost working point of 2.6 metres, while for the possibility of a fall of 6 metres, a projection of 4.4 metres is necessary.

(e) Nets should be securely attached to supporting framework, with tie cords, hooks, rings or thimbles spaced at a maximum of 750mm. The actual tie should be at least double the strength of the net and, if hooks are used, they must have a positive locking of some description.

(f) Nets can be outrigged on scaffolding, provided that the scaffold structure is securely tied into a building or other similar fixing.

### 16.2 CARE OF NETS

Care should be taken to reduce to a minimum unnecessary wear and mechanical damage likely to weaken the net. Materials must not be stacked on it and deliberate jumping into, or dropping of objects onto nets, must be prohibited.

## 17. SAFETY BELT, HARNESS AND LANYARDS

### 17.1 WEAR THE FALL ARREST SYSTEM SAFELY AND CORRECTLY

(a) Workers should use safety equipment properly despite the discomfort and inconvenience that may arise from the use of the safety equipment (most commonly the individual fall arrest system). One common reason for misuse is that by anchoring their individual fall arrest system, it may hinder them from doing their work due to restricted movement. Hence, for convenience, they may choose not to anchor. Such undesired practices can also be due to the lack of knowledge on the danger of their work and the importance of the individual fall arrest system. Employers are recommended to choose the most suitable.

(b) Selection of equipment
The correct selection of a safety harness of safety belt is important. If any doubt exists concerning the suitability of a piece of equipment for a particular task or type of work, further information and advice should be sought from the manufacturer. Whatever type is chosen it should give a high degree of safety allied to mobility and wearer comfort.

(c) General
When a fall is arrested by a belt, the shock loading is highly concentrated and the person who fell may end up in an awkward position. Harnesses are better in these respects.

(d) In order to limit the drop, the anchorage points should always be as high as possible above the person and as near to vertical as possible in order to avoid 'swing'. Anchorage points must be capable of withstanding shock loading.

(e) Markings on belts and harnesses
Safety belt and harnesses must be clearly and indelibly marked or permanently labelled with the following information:

- The British Standard, or European Standard, to which it conforms
- The name, trademark or other means of identification of the manufacturer
- The year in which the harness of belt was manufactured
- 'MAXIMUM SAFE DROP 2m' (as appropriate) together with details of any recommended safety lanyards for use with the safety belt or harness
- The type of belt or harness
- The manufacturer's serial number.
- Size
- Load Capacity

(f) Shock absorbers
If a person wearing a harness and lanyard falls, there is a considerable shock loading to the body, and the further the fall, the greater the shock. Generally speaking the maximum distance a person could fall before an arrest is two metres.
Shock absorbers in the form of tear-away stitching stretch springs or a deforming metals strip may be built into the lanyard or safety harness to reduce the shock loading. Once these have been deployed in a fall, they must be discarded.

(g) Arrester devices
These devices are similar in operation to the 'inertial reel' safety seatbelt fitted in cars. The safety belt or harness is attached to a self reeling cable which is securely anchored. The wearer is free to move normally but, in the event of a sudden movement (a fall), the locking device is brought into operation.

(h) Webbing and leather.
Examine for cuts, cracks, tears or abrasions, stretching and distortion, damage due to deterioration, contact with heat, acids or other corrosives and rot.

## 18. BRITISH STANDARDS FOR BELTS, HARNESSES/LIFELINES

| | |
|---|---|
| BS EN 354 | Personal protective equipment (PPE) against falls from a height - lanyards |
| BS EN 355 | Personal protective equipment (PPE) against falls from a height - energy absorbers |
| BS EN 361 | Personal protective equipment (PPE) against falls from a height - full body harness |
| BS EN 362 | Personal protective equipment (PPE) against falls from a height - connectors |
| BS EN 363 | Personal protective equipment (PPE) against falls from a height - fall arrest systems |
| BS EN 365 | Personal protective equipment (PPE) against falls from a height - general requirements for instructions for use and for marking |

## 19. WORKING AT HEIGHT RESCUE PLAN

### 19.1 PURPOSE

A rescue plan for working at height will assist in preventing a fatality caused by suspension trauma. Measures must also be taken to ensure that persons at height are promptly rescued if suspended.

### 19.2 THE NEED FOR A RESCUE PLAN

The suspended employee faces considerable danger after a fall, through the lack of a detailed and fully implemented rescue plan. The best rescue strategy is to take every possible precaution to prevent employees from falling in the first place.

But the reality is that falls happen, and a rescue plan is an essential component of the organisation overall fall protection method statement and risk assessment. The lack of any form of a pre-conceived post-fall rescue plan not only puts the fall victim at risk but also puts rescuers in harm's way. Whenever there are unplanned attempts to rescue, second or third injuries or fatalities may not be uncommon.

## 19.3 DESCRIPTION

### TIME FRAME

After the fall, the employee will hang in an upright posture with the legs relaxed straight beneath the body. Rescue would have to occur in 7 minutes for a chest attachment point and 11 minutes for a back-attachment point. Being suspended in this manner may cause death due to suspension trauma.

### SUSPENSION TRAUMA – ORTHOSTATIC INTOLERANCE

Unless the suspended employee is rescued promptly using established safe procedures, suspension trauma caused by orthostatic intolerance could occur and result in serious or fatal injury as the brain, kidneys and other organs are deprived of oxygen. Most users of fall protection equipment are unaware of the hazard of suspension trauma.

### VENOUS POOLING - THE NEED TO FAINT AND FALL OVER

Death from suspension trauma is caused by orthostatic intolerance and is the result of venous pooling. This can occur any time a person is required to stand still for prolonged periods and may be worsened by heat and dehydration. Major blood vessels pass through the muscles in the legs. The movement of these muscles assists circulation by squeezing the blood back up towards the heart. If the muscles stop moving, gravity pulls the blood down into the legs.

Eventually, enough blood accumulates (venous pooling) so that return blood flow to the right chamber of the heart is reduced as the heart can only pump the blood available, so its output begins to fall. The heart then speeds up to maintain sufficient blood flow to the brain but, if the blood supply to the heart is restricted enough, the higher pulse and faster breathing is ineffective, and the body abruptly slows the heart. The result is loss of consciousness and fainting.

The moment a person loses consciousness they collapse and become horizontal, so the time spent in a vertical position while unconscious is minimal and, as blood flow improves - the result of being horizontal - the person returns to consciousness and recovery is likely to be rapid.

When a person is suspended in a harness in which their legs are immobile, unlike fainting, the person does not or cannot naturally move into a horizontal position, then gravity pulls blood into the lower legs. In a harness, the employee can't fall into a horizontal posture, so the reduced heart rate causes the brain's blood supply to fall below the critical level. During excessive venous pooling, cardiac output and arterial pressure fall to levels, which can critically reduce the quantity and/or the quality of oxygenated blood flowing to the brain.

Three things that occur which aggravate the problem:

- The employee is suspended in an upright posture with legs dangling.
- The safety harness straps exert pressure on leg veins (femoral arteries), compressing them and reducing blood flow back to the heart.
- The harness keeps the employee in an upright position, regardless of loss of consciousness.

Loss of consciousness assures that a suspended person will not be moving their limbs; so venous pooling will increase which will in turn reduce the circulating blood volume even further. This includes not only a potentially fatal reduced blood flow to the brain, but also the other vital organs, such as the kidneys. The kidneys are highly sensitive to blood oxygen levels and renal failure as a result of excessive venous pooling is a real possibility.

Injuries suffered during the fall, or the shock resulting from the experience of the fall, can increase the onset and severity of venous pooling and orthostatic intolerance, as can physical and environmental

factors such as fatigue, dehydration, hypothermia, cardiovascular disease, respiratory disease and blood loss. The time spent in an unmoving suspended position, with the legs below the heart, is what kills a person.

## 19.4 CRITICAL PHASES OF RESCUE

The responsibility to have a post-fall rescue system in place lies with the organisation or occupier as the employer and site manager. Listed below are the four critical phases of rescuing a suspended employee:

1. Before the fall.
2. At fall arrest.
3. Suspension.
4. Post-fall rescue.

Each phase presents unique safety challenges. Suspension trauma can be influenced by all aspects of the fall, so they are all equally important. As with many aspects of safety, increasing the safety in one phase can compromise safety in the others. Whatever training employees have received will determine how they respond to different phases.

## 19.5 BEFORE THE FALL

The key issue of fall protection prior to a fall is compliance. If a safety harness is too uncomfortable, too inconvenient or interferes too much with task completion, employees may not use the equipment or may modify it (illegally) to make it more tolerable.

A second major point is how far an employee falls before his fall is arrested. The greater the fall, the greater the stress on the body when the fall is arrested. The longer the lanyard the longer the fall distance, however, the shorter the lanyard, the more often it will have to be repositioned when employees are mobile. Restraint lifelines are the preferred method of working because it allows maximum flexibility. Working in restraint prevents the employee from falling, yet should a fall occur the arrest distance is kept to a minimum (limited fall).


[1] A full body harness - one, two or three 'point' dependent on the work activity.

[2] An intermediate attachment or connecting device to join the harness to the anchorage point or connector e.g. a shock absorbing lanyard/man-yard, fall arrest block, rope grab etc. NB. The potential fall distance must be calculated to determine the type of intermediate attachment to be used.

[3] An anchorage connector - if the intermediate attachment does not have its own in-built anchorage connector then you will need one e.g. a webbing strap, steel sling or girder grip etc. to attach the intermediate device to the anchorage/secure tie-off point i.e. the girder, scaffolding or life line.

## 19.6 AT FALL ARREST

The whole concept of fall protection is that employees who falls will be stopped by a tethering system. Unfortunately, the posture of the falling employee is unpredictable. Depending on the harness attachment point and the position of the employee's body at fall arrest, different harness attachments offer different advantages. An attachment near the shoulders means that any drag from the lanyard will serve to position the employee's body in an upright position so the forces are distributed from head to foot. The head is somewhat protected if the legs and body precede it in the fall, but this offers some disadvantages after the fall arrest is completed.

### *The functional equipment categories*

**Fall Arrest:** The legislation as outlined above, states that a fall arrest system be used when working at heights of 2 metres or more if a fall hazard exists.

*This type of system consists of:*

- *Body Wear* - Full body harness (when choosing personal fall protection equipment, it is recommended that you plan for a possible rescue or evacuation. A 2 or 3 point harness will allow you to attach a rescue device)
- *Intermediate Attachment* - with shock absorbing element e.g. Shock absorbing lanyard, Fall arrest block etc
- *Anchorage Point/Anchorage Connector*

**Positioning:** A positioning system is used to hold a worker in place allowing a hands free work environment at elevated heights.

*This type of system typically consists of:*

- *Body Wear* - Harness or belt (positioning belts can only be used without a harness when a fall hazard does not exist)
- *Intermediate Attachment* - Positioning lanyard and Fall arrest system
- *Anchorage Point/Anchorage Connector*

**Restraint:** A restraint system is used to restrict the worker's movement in order to prevent him from reaching a location where a fall hazard exists.

*This type of system typically consists of:*

- *Body Wear* - Full body harness or Belt (positioning belts can only be used without a harness when a fall hazard does not exist)
- *Intermediate Attachment* - Restraint lanyard
- *Anchorage Point/Anchorage Connector*

## 19.7 SUSPENSION

It is natural to assume that once a fall has been arrested then the fall protection system has successfully completed its job. Unfortunately, this is not the case. An employee suspended in an upright position with the legs dangling in a harness of any type is subject to suspension trauma and orthostatic intolerance.

Fall victims can slow the onset of suspension trauma by pushing down vigorously with the legs, by positioning their body in a slight leg-high position or, by standing up. Harness design and fall injuries may prevent these actions.

## 19.8 RESCUE

Rescue must come rapidly to minimize the dangers of suspension trauma. The circumstances together with the lanyard attachment point will determine the possibility of self-rescue. In situations where, self-rescue is not possible, employees must be supervised at all times. Regardless of whether an

employee can self-rescue or must rely on others, time is of the essence because an employee may lose consciousness in only a few minutes.

For conscious rescues it is recommended (where possible) that the suspended person keep their legs moving to keep the blood pumping and reduce the risk of venous pooling.

## 19.9 FIRST AID PROCEDURES

Following completion of evidence-based review of published medical literature: HSE has clarified guidance on the first aid management of a person falling into suspension in a harness who may develop 'suspension trauma'. The key recommendations are:

a) No change should be made to the standard first aid guidance for the post recovery of a semi-conscious or unconscious person in a horizontal position.
b) No change should be made to the standard first aid guidance.
c) A casualty who is experiencing pre-syncopal symptoms or who is unconscious whilst suspended in a harness shall be rescued as soon as is safely possible.
d) If the rescuer is unable to immediately release a conscious casualty from a suspended position, elevation of the legs by the suspended employee or rescuer where safely possible may prolong tolerance of suspension.

## 19.10 WHAT TO LOOK OUT FOR - IF A WORKER IS SUSPENDED IN A HARNESS

The possible signs and symptoms of orthostatic intolerance can start to be seen in 2 to 3 minutes and can include:

- Faintness
- Nausea
- Breathlessness
- Dizziness
- Sweating
- Unusually low heart rate
- Unusually low blood pressure
- Paleness
- Hot flushes
- Skin tone may appear grey in color
- Loss of vision
- Increased heart rate

Upon rescue from height, the employee shall be transported to the hospital for examination and observation.

## 19.11 METHODS OF RESCUE

Although there are numerous methods to rescue a suspended employee, here are a few methods to consider.

## 19.12 CRANE MAN BASKET RESCUE

This option has severe limitations, the main one being time. Target time from 'Man Down' to being recovered needs to be no more than five minutes. Other restrictions and shortcomings that make this a less than ideal solution are:

- The crane is out of action for some reason, e.g. it may be 'winded-off'.
- The driver may be away from the crane.
- Rescue by crane is limited to building facades and often is not able to provide access and rescue internal to the structure.
- The crane man basket may be in the wrong location.

## 19.13 AERIAL WORK PLATFORMS RESCUE (AWP)

This option for rescue can have its limitations such as available access and height restriction as the suspended employee may be at a height greater than the reach of the AWP.

## 19.14 ROPE ACCESS RESCUE

Technical rope rescue requires a high level of competency. It requires constant training and assessment to retain the skills. Given the limited time to complete a rescue, trained rope rescue personnel would need to be on stand-by fully donned and within close proximity to any incident. This is most suited in the event a complex rescue may be required.

Rope rescue requires technical competency, which demands a high level of training and re-training to acquire and retain this skill set. Given the limited time to complete a rescue, trained rope rescue personnel would need to be on stand-by and within close proximity to any incident. Donning the necessary kit to carry out a rope rescue can also be time consuming given that every minute the casualty is hanging is critical. Perhaps the greatest restriction is that it is a skill to which only a few would, or could, be trained.

## 19.15 THIRD PARTY RESCUE SYSTEMS

There are a number of considerations to take into account when considering third party rescue systems. In every consideration TIME is the critical factor and should be done as quickly as possible, but sufficient safe for the rescue crew. The speed with which the system can be deployed, and the rescue carried out is vitally important, as is the simplicity and ease of use so that a typical employee can deploy and carry out a rescue after being trained. This is most suited when a simple rescue is pre-determined. You may also need to consider the advantages and limitations of each kit.


Third party rescue systems

Whichever methodology is chosen, the target time should be to rescue the suspended employee in under five minutes.

The work at height rescue plan document shall be audited and updated:

- At least annually.
- As required due to a rescue process change or implemented.
- As the result of lessons learned from testing the plan or having to utilize the plan to perform a rescue.

It is recommended that at least one person within a group of persons working at height, is competent and trained to rescue from height. It is the responsibility of the employer or occupier to ensure that no work at height is undertaken without first preparing and implementing a rescue from height plan. All work at height activities must, at all times, be adequately supervised by a trained and competent supervisor. The checklist for work at height rescue plan is attached to this docuument as Appendix A.

## APPENDIX A
## CHECKLIST WORK AT HEIGHT RESCUE PLAN

JOB TASK:

Work at Height Dates: From: ..... To: .....

What is task(s) to be performed? Check all that apply:

- ☐ Inspect scaffold
- ☐ QC function
- ☐ Tie rebar
- ☐ Build or dismantle scaffold
- ☐ Hang gang forms
- ☐ Apply form release
- ☐ Paint
- ☐ Core Drill
- ☐ Hang temp lights or extension cord
- ☐ Pour concrete
- ☐ Operate concrete vibrator
- ☐ Finish concrete
- ☐ Material handling
- ☐ Other. _____

Names of employees who are involved in the work at height:

| | Printed Name | Signature |
|---|---|---|
| 1. | _____ | _____ |
| 2. | _____ | _____ |
| 3. | _____ | _____ |
| 4. | _____ | _____ |
| 5. | _____ | _____ |
| 6. | _____ | _____ |
| 7. | _____ | _____ |
| 8. | _____ | _____ |
| 9. | _____ | _____ |
| 10. | _____ | _____ |
| 11. | _____ | _____ |
| 12. | _____ | _____ |
| 13. | _____ | _____ |
| 14. | _____ | _____ |
| 15. | _____ | _____ |

**Person Responsible for Working at Height Rescue (WAH)**

Printed Name _____ Signature _____

Printed Name (Backup) _____ Signature _____

As always, if someone is not in charge, everyone is in charge. Thus, establish the person to be in charge in advance with a backup should it be necessary.

**COMMUNICATION:**

What communication systems will be used between the suspended worker and supervisor / rescue team?

- ☐ Direct voice communication
- ☐ Whistle
- ☐ Mobile Phone
- ☐ Two-way Radios / Headsets

**EMERGENCY CONTACT:**

In the event of an emergency / fall from height the WAH supervisor shall immediately alert:

1) Fire Department
2) EMT
3) HSE Manager

**SAFETY OF RESCUERS:**

1) Are employees competent in the use of rescue equipment?
    a. Yes
    b. No
2) Are rescue training records up to date?
    a. Yes
    b. No
3) Is there a sufficient number of rescuers available?
    a. Yes
    b. No
    c. Number?
4) Is rescue equipment selected appropriate for the nature of work?
    a. Yes
    b. No
5) What obstructions are in the way of reaching the suspended employee?
    a. _____
6) What is the plan to overt the obstruction?

a. _____

7) Have assessments been made of anchor points?
   a. Yes
   b. No

8) What is the actual plan to rescue the suspended employee? Check all that apply.
   - ☐ Ladder
   - ☐ Man Lift
   - ☐ Crane with Basket
   - ☐ Fork Lift with Basket
   - ☐ Winch
   - ☐ Tripod and Winch
   - ☐ Descent Rescue Kit
   - ☐ Suspended Access Equipment
   - ☐ Climbing Rope Rescue System
   - ☐ Stokes Basket
   - ☐ Pull employee in through window / balcony
   - ☐ Pull employee up through floor, slab or roof
   - ☐ Affix rope, cable, etc. to "D" ring of suspended employee. Raise suspended employee slightly then unhook their primary lanyard.
     - ○ Raise suspended employee
     - ○ Lower suspended employee

## TESTING THE PLAN

1) Has the plan been tested?
   a. Yes
   b. No
   c. When? _____
2) Please describe the rescue process.
   a. _____
   b. _____
3) How long did it take to complete the rescue?
   a. _____

## PROTECTING OTHERS

How will others be protected?

- ☐ Move non-essential personnel to a muster point.
- ☐ Set up a barricade.
- ☐ Curtail traffic to the area.

## PROTECTING THE SCENE

How will the scene be protected from change prior to completing a full assessment of the root cause?

- ☐ Keep non-essential personnel out of the area.

- ☐ Begin assessing the scene immediately after the suspended person has been treated and moved from the area.
- ☐ Preserve wreckage.
- ☐ Report the incident immediately to the proper channels.
- ☐ Obtain approval to photograph the scene.

## OTHER CONSIDERATIONS

- ☐ Are employees using the buddy system?
    - ○ Yes
    - ○ No
- ☐ How are you checking on employees working in remote areas?
    - ○ _____
- ☐ Are there unusual features of the building or structure that could hide a person from view in the event of an incident?
    - ○ Yes _____
    - ○ No
- ☐ Are you aware of weather conditions?
    - ○ Yes
    - ○ No
    - ○ Changing conditions _____
- ☐ Is a translator available?
    - ○ Yes
    - ○ No

**END**