CODE OF PRACTICE

WORKSAFE VICTORIA

PREVENTION OF FALLS IN GENERAL CONSTRUCTION

March 2004

OCCUPATIONAL HEALTH AND SAFETY ACT 1985
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CONTENTS

Occupational Health and Safety Act 1985

The *Occupational Health and Safety Act* sets out general duties of care applying to employers, employees, self-employed persons, occupiers, designers, manufacturers, importers and suppliers. The Act enables regulations to be made in relation to the safety, health and welfare of people at work.

Occupational Health and Safety (Prevention of Falls) Regulations 2003

The *Occupational Health and Safety (Prevention of Falls) Regulations* apply to fall hazards of more than 2 metres. The aim of the Regulations is to prevent people at work from falling and to prevent or reduce injury that result from those falls.

Section 47(1) of the Act states that failure to comply with regulations made under the Act is an offence.

Code of Practice for the Prevention of Falls in General Construction

The *Code of Practice for the Prevention of Falls in General Construction* provides practical guidance to employers on how they can meet the requirements of the *Occupational Health and Safety (Prevention of Falls) Regulations 2003* to eliminate or reduce the risk of falling from height in the construction industry.

Falls from heights of more than 2 metres

Part 2 of the code provides practical guidance on how to comply with the Regulations.

Falls from heights of 2 metres or less

Part 3 of the code provides practical guidance on how to comply with general duties under the Act in relation to falls of 2 metres or less.

PART 1: INTRODUCTION

1. SCOPE OF THE CODE

The Code of Practice for the Prevention of Falls in General Construction applies to the construction, renovation and demolition of all types of buildings and structures. It also applies to any excavation undertaken in relation to the construction of buildings and structures covered by this code.

Although this code applies to all buildings and structures, readers should refer to the *Code of Practice for the Prevention of Falls in Housing Construction* for guidance on buildings of three habitable storeys or less (based on classes 1, 2 and 10 of the Building Code of Australia). For guidance specific to the demolition industry, refer to the *Code of Practice for Demolition*.

2. PURPOSE OF THE CODE

This code provides practical guidance to employers, contractors and employees engaged in general construction on how they can meet their obligations under the *Occupational Health and Safety (Prevention of Falls) Regulations 2003* (the Regulations).

3. DUTIES OF PRINCIPAL CONTRACTORS AND SUBCONTRACTORS TO PREVENT FALLS

What must the principal contractor do to prevent falls?

The *Occupational Health and Safety Act 1985* (the Act) imposes a duty on employers to protect their employees from risks to their health and safety. As the principal contractor with overall management and control of the building site this duty extends to any subcontractors, and their employees, you have engaged to carry out works on the site. In addition, the *Occupational Health and Safety (Prevention of Falls) Regulations 2003* (the Regulations), require you to ensure that your own employees and your subcontractors, including their employees, are protected from the risk of a fall as far as practicable.

To fulfil your principal contractor obligations you should ensure that the site health and safety management plan (the plan) provides for fall protection for all workers on site. As far as feasible you may chose to directly supply and maintain the fall control measures (see section 4.4 for guidance on fall control measures).

Alternatively, the contract could specify that each subcontractor must supply fall protection. However, if you adopt this approach, you have a duty to ensure that the subcontractor provides and maintains the fall protection in accordance with the contract, for the duration of the work.

Careful project planning can help to reduce the risk. Sequence jobs so that different trades are not interfering with each others' work. Schedule activities so that your employees and subcontractors are not working above or below each other at the same time.

Checklist for principal contractors

These are some of the issues you should consider when selecting and coordinating contractors and work schedules.

- Has the contract been prepared to take into account the access and fall protection needs of all parties?
- Apart from plans and specifications, can you provide the subcontractor with any other information that will assist him or her to perform the work safely?
- Have you made sure the subcontractor understands the correct sequence of critical operations to be carried out on site?
- Is the subcontractor competent to perform the work safely? (Competence may have been developed through training and/or experience.)
- Have you or the subcontractor identified fall hazards and assessed the risk of falling, for example, through a documented risk assessment, such as a Job Safety Analysis (JSA)?
- Have you or the subcontractor implemented effective fall protection measures?
- Have you set in place sufficient supervision to monitor the subcontractors' safety performance?

What must a subcontractor do to prevent falls?

If you are a subcontractor who has direct employees, the Act imposes duties on you as an employer to protect your employees from risks to their health and safety. This duty extends to any other subcontractors, and their employees, you have engaged to undertake work on the site.

At the same time the Act and the Regulations consider you, *and your employees*, to be employees of the principal contractor who has duties in respect of your health and safety, as discussed above.

Employer obligations therefore apply to both the principal contractor and to you as a subcontractor. Generally, the more control principal contractors have over the work environment and the task to be performed, the greater their responsibilities towards subcontractors and their employees. On the other hand, the more autonomy subcontractors have in carrying out the job, the greater their responsibility towards their own employees. The key is to determine which things are within the control of each duty-holder.[1] Where feasible, this should be determined before the job starts and be set down in the contract.

Under the Act, you have a duty to ensure that your activities do not expose anybody (including other workers, site visitors and members of the public) to health and safety risks. However, your duty does not extend to the activities of other subcontractors (other than your own). For example, a roofing contractor is not required to check that another subcontractor, such as a painting contractor, has provided the necessary fall protection for the painters. This responsibility rests with the principal contractor and the painting contractor.

Checklist for subcontractors

Before commencing work on a job, ensure that:

- the contract clearly establishes the responsibilities of principal contractor and subcontractor regarding the provision and maintenance of fall protection
- you have all the information needed to do the job safely
- you, or the principal contractor, have identified fall hazards and prepared a documented risk assessment, such as a Job Safety Analysis (JSA) (see section 4.3 for advice on risk assessment)
- agreed risk controls are in place and safe work procedures have been established
- your employees (if any) have received adequate training and instruction in the use of the agreed risk controls and safe work procedures.

You should notify the principal contractor if any unexpected fall hazards are identified before or during the job.

1 Note that occupational health and safety obligations in relation to these things cannot be contracted out to other duty-holders.

4. DUTIES OF EMPLOYERS

If you are an employer, you have duties under the Regulations to protect your employees from falls from heights of more than 2 metres. These duties extend to all subcontractors and their employees that you engage to work for you.

If another person is carrying out a task on your behalf, you have a responsibility to ensure that he or she has the appropriate information, instruction and training to carry out the task safely.

4.1 Consult your employees

The Regulations require you to consult your employees' health and safety representatives when identifying fall hazards, and when assessing and controlling the risk of a fall.[2]

If your workers do not have a health and safety representative, it is a good idea to consult with your workers. Their experience and knowledge can help you to identify fall hazards and control the risks.

Many construction workplaces employ people from non-English speaking backgrounds. When consulting, consider the communication needs of these employees.[3]

4.2 Identify fall hazards

Before work starts, you need to identify all physical locations and tasks that might cause an employee or subcontractor to fall more than 2 metres. This includes travelling to and from the task.

You need to look at the task to determine whether there is a risk of falling. In particular, you must look at tasks carried out:

- on any structure or plant being constructed or installed, demolished or dismantled, inspected, tested, maintained, repaired or cleaned
- on a fragile surface (for example, cement sheeting roofs, rusty metal roofs, fibreglass sheeting roofs and skylights)
- on a potentially unstable surface (for example, areas where there is potential for ground collapse including poorly backfilled or compacted ground, or unstable areas such as on top of stacks of building materials, timber pallets or bricks)
- using equipment to work at the elevated level (for example, when using scaffolds, elevating work platforms or portable ladders)
- on a sloping or slippery surface where it is difficult for people to maintain their balance (for example, on glazed tiles)
- near an unprotected open edge (for example, near perimeters without guardrails, or incomplete stairwells)
- near a hole, shaft or pit into which a worker could fall (for example, trenches, pile holes or service pits).

4.3 Assess the risk of a fall

If you identify a task involving a fall hazard, you must assess the risk of a fall occurring. If any of the following factors are present, there is a risk. Note: This is not an exhaustive list.

Risks of the task

The following factors present a risk.

- Workers are handling unstable or cumbersome objects (such as sheets of plaster, or roofing sheets, which can be caught by the wind).
- The task is lengthy and exposes workers to the risk for long periods of time.
- Workers use chemicals such as solvents or paints that may cause dizziness or loss of coordination.
- New or inexperienced workers are involved in the task.
- Workers are welding galvanised, chemical-coated or similar materials.

Risks within the working environment

The following factors present a risk.

- The slope of the raised work surface makes it difficult for workers to maintain their balance.
- The work surface is slippery (wet, oily, dusty or glazed).
- The work surface is uneven (for example, broken ground).
- The work surface is too cramped, preventing workers from moving freely.
- Tools, work materials and debris clutter the work surface.
- Workers carry out the task in adverse weather conditions (for example, in rain, strong or gusty winds, extreme heat or high humidity).
- There are unprotected edges or penetrations that are difficult to see because of obstructions, glare or deep shadows.
- Building materials, large tools, or equipment need to be manually carried up to the job.
- Several, different contractors are in the same work area at the same time.
- Pedestrians or road traffic interfere with workers doing the task.

*2 For more information, see the WorkSafe guidance note **Consulting with Employees on Health and Safety** at www.workcover.vic.gov.au under "Guidance Notes".*

*3 Refer to the **Code of Practice for Provision of Occupational Health and Safety Information in Languages other than English** for guidance on providing information, instruction and training in multilingual workplaces.*

4.3.1 Generic risk assessment

If you undertake similar tasks or processes in a number of different work areas or workplaces, you may only need to do a single risk assessment.

A single, or generic, risk assessment will only be appropriate, however, if the hazards and risks for the work areas being covered by the assessment are the same or similar.

For example, if a generic assessment is undertaken by an industry association as a model to be used by a number of different employers with essentially identical workplaces, you are responsible for ensuring that the assessment is valid for your workplace.

As with risk assessments generally, you must, if practicable, consult with health and safety representatives when carrying out generic risk assessments.

4.4 Control the risk

If there is a risk that a fall may occur, you need to put in place measures to control the risk. The primary duty is to eliminate the risk. If this is not practicable, the risk must be reduced so far as is practicable. The Regulations set out a hierarchy (or ranking) of risk controls that you must apply.

Eliminating the risk of a fall is the most effective way of protecting your employees and subcontractors. You must apply the controls in the order listed (see 4.4.1 Hierarchy of control). Only where it is not practicable to use a higher order control may you then use a control at the next lower level.

Where it is practicable to undertake part of a task using a higher order control, that control must be used to the extent possible. Where a risk of a fall remains in undertaking the works, then the next level of controls must be applied wherever practicable.

4.4.1 Hierarchy of control

Level 1: Undertake the work on the ground or on a solid construction (see section 6.1 and 6.2)

Level 2: Undertake the work using a passive fall prevention device (see section 6.3)

Level 3: Undertake the work using a work positioning system (see section 6.4)

Level 4: Undertake the work using a fall injury prevention system (see section 6.5)

If after considering all of the control measures listed above, a risk remains, you must control the risk using the following forms of control:

Level 5: Undertake the work from ladders, or implement administrative controls (see section 6.6 and 6.7)

4.4.2 What does "practicable" mean?

"Practicable" does not just mean the cost in dollar terms. To determine what is practicable, you must take into account:

- ***the severity of the hazard or risk***

  How likely is it that employees will fall from a height? How serious are the injuries likely to be, and how many people are likely to be exposed to the fall hazard?

- ***the state of knowledge***

  What is known about the hazard and the ways of controlling the risk? How do similar businesses or workplaces control the risk of falling? What information can be provided by OHS professionals, industry associations, unions and government bodies? What can you find out from manufacturers and suppliers about risk control equipment?

- ***the availability and suitability of ways to remove or mitigate the hazard or risk***

  Are the risk controls you have identified available? Are they suitable for the work site, the task and the employees using them?

- ***the cost of removing or mitigating the hazard or risk***

  What are the costs of eliminating or reducing the hazard or risk, now and in the future?

4.4.3 Make sure control measures are safe and don't introduce new risks

When selecting the most practical control measure, you must also consider any non-fall risks associated with those measures. Non-fall hazards could include electrical hazards, such as contact with overhead and temporary electrical cabling, and crushing and entanglement from plant such as elevating work platforms.

Make sure that the control method you select doesn't expose those installing, erecting or removing it (such as scaffolders) to a greater risk than the one it is designed to control, even if it is highly effective once in place.

If plant or equipment is used to control the risk, it must be "fit for purpose", that is, it must be designed and constructed for the task and the working environment.

Consider the following in regard to the plant or equipment.

- Has it been designed to enable workers safe access and egress to both the plant and equipment and onto any necessary parts of the structure (such as access onto a roof)?

- Have the fall risks for persons installing or erecting the plant or equipment been identified and controlled?
- Has it been designed for all the intended loads, including temporary placement of materials?
- Have the foundations been assessed to take the imposed loads?
- During installation, use or dismantling, is it possible for workers or equipment to come into contact with powerlines (for example, when landing roofing onto the structure by crane)?

4.4.4 Maintain controls

The Regulations require you to ensure that control measures are properly used and maintained. This means that your plant and equipment should be inspected, tested and serviced regularly. You also need to regularly monitor the control measures being used, and ensure that your workers are using them properly. Where an alteration of specific plant or fall protection measures is to be undertaken, the principal contractor should make sure that the integrity of the system is maintained and that clear arrangements to this effect are in place with subcontractors.

4.4.5 Establish emergency procedures

Unless you have controlled the risk of a fall by arranging for the work to be constructed on the ground or on a solid construction, you must ensure that emergency procedures are in place that enable you to rescue a worker who has fallen. The emergency procedures also need to cover first aid.[4]

When developing these procedures, consider the different types of emergency and rescue scenarios that might arise. Use the information from your risk assessment to help you in this task. In the event of a fall, will it be necessary to retrieve the injured worker from potential fall sites? If so, is the equipment to perform a rescue readily available? It is important that the rescue of a worker who is suspended in a full body harness should occur promptly. Effective emergency procedures may require one or more of the following actions.

- Workers using safety harnesses do not work alone.
- A person trained in rescue techniques is allocated to each site.
- Rescue equipment is pre-rigged and ready for use.

The emergency procedures must also cover the provision of first aid. The procedures should:

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

If the job is to be carried out in a remote location outside the mobile telephone network and other means of communication are not available, procedures will need to be developed that take account of the situation.

As far as practicable, emergency procedures must be carried out immediately after the emergency situation arises.

Emergency procedures should be rehearsed. Make sure that all workers likely to be involved in performing emergency procedures know what to do in the event of a fall from height.

4.4.7 Provide instruction, information and training

Information, instruction and training should 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
- what action to take if there is an incident.

The amount and type of information, instruction and training required depends on the severity of the hazard and the risk involved. It also depends on the level of operator skill required to operate or use the control measure. Tasks involving complex work procedures or risk control measures will probably require a comprehensive training process.

For example, an individual fall arrest system (IFAS) requires a high level of competency on the part of the user to ensure it is used properly. Employees who use these systems should be trained in the correct fitting, anchorage, use and maintenance of the IFAS, as well as the nature of the fall hazard and the risks of injury associated with tasks that they undertake using IFAS. This training should cover the risks of injury associated with an arrested fall. (See section 6.5 for specific guidance on the information, instruction and training for workers using IFAS.)

*4 See Code of Practice – **First Aid in the Workplace** for more information.*

Other control measures may not involve any operator skill to use and therefore not require an extensive training process. Depending on the task being carried out, an information and instruction program may only be necessary for such control measures. For example, guardrail systems do not require any special skills on behalf of the employees being afforded protection. However, employees working where a guardrail system is used to control the risk of falling do need to have knowledge of why the guardrail system is needed and any limitations of the system. They should, for example, be instructed not to stand on, climb over, or remove any part of the guardrail system.

Induction training should be provided for all new workers. It is a good idea to keep a record of training to enable ongoing program 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.

Remember that while training is important, it is not a substitute for effective risk control measures.

5. DUTIES OF EMPLOYEES

If you are an employee exposed to fall hazards, your employer must provide you with information, instruction and/or training so you can do your job safely.

Under the Regulations, you must carry out tasks using the risk control measures provided by your employer, in keeping with the information, instruction and training you receive. However, if you believe that the work cannot be carried out safely, you should discuss your concerns with your supervisor or health and safety representative.

6. METHODS OF CONTROLLING RISK

This section provides detailed guidance on practicable fall protection measures for use in the construction industry. The guidance is set out in the order of the hierarchy of control described in the section 4.4.1. Wherever it is practicable to do so, controls at the top of the hierarchy must be implemented before consideration is given to implementing lower order controls.

However, the methods selected must be appropriate to the particular task, the severity of risk and the employees involved, having regard to what is practicable.

6.1 Work on the ground

Eliminating the need to work at height is the most effective way of protecting the safety of your workers. Think about how you could do the work without exposing them to a risk of falling from a height or into a depth. Examples of elimination include:

- prefabrication of roofs at ground level
- prefabrication of wall frames horizontally, then standing them up
- using precast or tilt-up concrete construction instead of concrete walls constructed *in situ*
- using paint rollers with extendable handles
- using remote release shackles for crane lifted loads positioned at height
- controlled collapse of a structure (demolition).

6.2 Work from solid construction

Many areas of a construction site can be turned into solid construction. Careful and ongoing assessment of the physical location is needed to eliminate all areas in which workers could fall.

"Solid construction" means an area that has:

- a surface capable of supporting people and material and any other loads applied to it
- protection at its perimeter and around all open penetrations from, or through which, workers could fall
- an even and readily negotiable surface and gradient
- a safe means of access and egress.

Solid construction must satisfy **all** of the following requirements.

Structural strength

Different types of work involve different loads on the supporting surface. Make sure that surface and its supports can safely carry the expected loads – including workers, material, tools and equipment. When in doubt, make sure a structural engineer determines the safe load capacity before use.

Suspended floors can often be strengthened by back propping with adjustable building props. Where this method is used, make sure the props are tied to each other in the longitudinal and transverse directions with scaffold tubes and couplers to form a stable, free-standing structure, and that the props are supported on an adequate foundation.

Surface and gradient

Surfaces need to be non-slip and free from trip hazards and traps.

Smooth surface working areas should not be steeper than 7 degrees (1 in 8 gradient). Cleated or grated surfaces, which provide greater slip resistance, should not be steeper than 23 degrees (approximately 1 in 3 gradient).

Edge protection

Perimeter protection must be provided on the exposed edges of all work areas. These include:

- the perimeters of buildings or other structures
- the perimeters of skylights or other fragile roof materials
- openings in floor or roof structures.

Additional void protection

Where there is a risk that workers performing tasks off work platforms or ladders may fall over the guardrailing, stairwells and other openings should be covered. Coverings should be secured in place to prevent dislodgment and be designed to withstand any loads that may be imposed during construction works or in the event of a fall.

Figure 1 Guardrails protecting an open penetration through the slab

Access and egress

Every solid construction must have safe and suitable access and egress. Common means of access and egress include:

- existing floor levels
- permanently installed platforms, ramps, stairways and fixed ladders complying with Australian Standard AS 1657 *Fixed platforms, walkways, stairways and ladders – Design, construction and installation*
- temporary access ways and temporary stair systems
- secured single portable ladders set up at a slope of between 4:1 and 6:1, and extending at least 900 mm above the stepping-off point.

Ladder and stairway landings require the same level of edge protection adjacent to their open sides and ends as solid construction.

Stepladders and trestle ladders should not be used for access to or egress from solid construction.

6.3 Passive fall prevention devices

The Regulations define **Passive fall prevention devices** as "material or equipment, or a combination of material and equipment, that is designed and intended to prevent a person falling, and which, after initial installation, does not require any ongoing adjustment, alteration or operation by any person to ensure the integrity of the device to perform its function".

Passive fall prevention devices include temporary work platforms, roof safety mesh and perimeter guardrailing.

6.3.1 Temporary work platforms

A **temporary work platform** is a platform that provides a working area for the duration of work carried out at height, and which is designed to prevent a person from falling. It encompasses a wide variety of plant and equipment.

6.3.1.1 Scaffolds

Scaffolds are a common means of providing a safe work platform for working at height. There is a wide variety of scaffolding systems available.

Working platforms on scaffolds are generally rated as light, medium or heavy duty.

- **Light duty** – up to 225 kg per bay. This is suitable for plastering, painting, electrical work, and other light tasks
- **Medium duty** – up to 450 kg per bay. This is suitable for general trades work
- **Heavy duty** – up to 675 kg per bay. This is what is needed for bricklaying, concreting, demolition work and most other work tasks involving heavy loads or heavy impact forces
- **Special duty** – has a designated allowable load as designed.

These safe load limits include the weight of people (which is taken to be a nominal 80 kg[4] per person) plus the weight of any materials, tools and debris on the working platform. Therefore, a properly constructed mobile scaffold with a light duty platform can safely support 1 worker and 145 kg of tools and material, or 2 workers and 65 kg of tools and materials.

Any scaffold from which a worker or object could fall more than 4 metres must be erected, altered and dismantled by (or under the direct supervision of) a person with a WorkSafe certificate of competency of the appropriate class.

Scaffolds are subject to the requirements of the Plant Regulations regarding design, installation and use.

For further information on the safe selection, erection and use of scaffolds refer to:

- WorkSafe's *Code of Practice for Plant*
- AS/NZS 4576 *Guidelines for scaffolding*

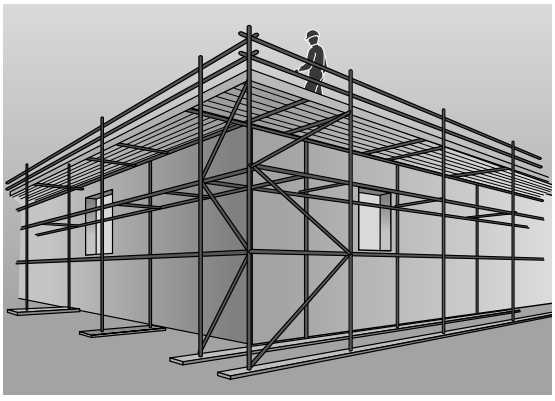


Figure 2 Typical tube-&-coupler scaffold (independent type)

4 The current review of the Australian Standards for Scaffolding may result in the nominal weight of a person being increased

Information, instruction and training for workers using scaffolds

Where work is performed from a scaffold, employers must ensure that the relevant workers understand:

- what loads the scaffold can safely take (such as how many bricks per bay)
- not to make any unauthorised alterations to the scaffold (such as removing guardrails, planks, ties, toeboards and braces)
- that working platforms need to be kept clear of debris and access obstructions along their length
- not to undertake work that may damage the scaffold (such as, the use of corrosive substances, undertaking tasks which result in high impact loads on the scaffold or the anchoring and use of chain blocks to scaffolds without specific design).

Where work is performed using mobile scaffolds, employers must ensure that the relevant workers understand that the scaffold should:

- remain level and plumb at all times
- be kept well clear of powerlines, open floor edges and penetrations
- never be accessed until the castors are locked to prevent movement
- never be moved while anyone is on it.

CASE STUDY: ERECTION OF MOBILE SCAFFOLDS

Hazards

- falling from height during erection and use
- electrical contact with overhead powerlines
- electrical tools and leads
- falling objects.

Risk factors

Surface conditions: stability/strength of the surface on which the scaffold will be placed is vital to the stability of the scaffold.

Weather conditions: inclement weather, including high wind, will exacerbate the risk during erection and use of the scaffold.

Housekeeping: a poorly maintained site could create impalement hazards for a falling worker.

Controlling risks associated with mobile scaffolds

1. Do not erect scaffolds in high winds or rain.
2. Ensure the ground conditions are suitable for placing scaffolds. Outdoors, earth preparation and/or timber bearers may be required to provide a stable and near-level surface. Indoors, if scaffolds are to be placed on a timber floor, ensure point loadings do not exceed the floor's structural capacity.
3. During erection, ensure that full decks of platforms are used wherever possible, handrails erected and ladder access is established progressively.
4. Ensure scaffold components conform to AS/NZS 4576 *Guidelines for scaffolding*.
5. Ensure that the erection and dismantling of scaffolds does not occur within a horizontal distance of 4.6 metres or a vertical distance of 5 metres (above or below) from live powerlines on poles.
6. Tag and test electrical tools and ensure that leads are taped down or elevated so they do not become a tripping hazard.
7. Falling objects: Provide toeboards and platform trapdoors to prevent tools and materials from falling; lanyard handtools.
8. Training: Ensure scaffold erectors have necessary certificates of competency (if platform height is 4 metres or more) or training.
9. Ensure site is cleared of rubbish and unnecessary materials that could constitute an impalement hazard.

Ladder-bracket scaffolds

Ladder-bracket scaffolds are not suitable for general construction work, because the ladders and brackets are usually not capable of safely sustaining the loads specified in AS/NZS 1576.1 and because the working platforms are usually narrower than the required minimum width of 450 mm.

Trestle scaffolds

Trestle scaffolds may be used at heights greater than 2 metres if guardrailing is incorporated to prevent people from falling off the open side or end of the working platform (see Figure 3). The system (including planks) should be assembled according to the manufacturer's specifications.

Some trestle ladder scaffolds include outriggers. Trestle ladder scaffolds are only suited to light duty tasks such as painting and rendering.

When adjusting the height of a trestle scaffold, make sure that only the purpose-designed hardened steel pins are used. Do not use nails or pieces of reinforcing bar.

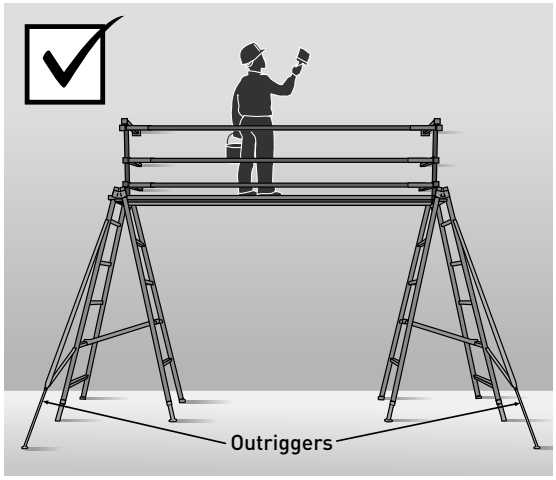


Figure 3 Trestle ladder scaffold with guardrailing and outriggers for stability

The maximum spacing of trestles should not exceed the maximum recommended span of the scaffold planks. Since 1993 random length scaffold planks manufactured in accordance with AS 1577 have this information marked on them. Where this information is not known, reference may be made to Table 1.

Work should only be performed between the trestles. Where a trestle scaffold is more than 1 bay in length, heavy loads (such as bricks, blocks or similar) should be placed directly over the trestles.

TABLE 1: MAXIMUM SPAN OF SOLID TIMBER SCAFFOLD PLANKS COMPLYING WITH AS 1577

Nominal thickness of plank (mm)	Maximum span (m)
38	1.5
50	2.0
63	2.5

Further guidance on trestle ladder scaffolds is provided in AS 4576 *Guidelines for Scaffolding*. A certificate of competency is not required for the erection of these types of scaffolds.

6.3.1.2 Elevating work platforms

Elevating work platforms (EWPs) are available in a wide variety of types and sizes. They include scissor lifts, cherry pickers, boom lifts and travel towers. There are battery powered and internal combustion engine types. Some are designed for hard flat surfaces only, while others are designed for operation on rough terrain.

EWPs:

- should only be used on a solid, level surface; the surface area should be checked to make sure that there are no penetrations or obstructions that could cause uncontrolled movement or overturning of the platform
- when designed as "rough terrain" units, may be used on other surfaces in accordance with manufacturers directions; the surface area should be checked for unacceptable penetrations or obstructions
- should be clearly marked with the safe working load limit.

Operators working in travel towers, boom lifts or cherry pickers should wear an anchored safety harness. The harness system used must be able to arrest a fall before the user strikes the ground.

Operators of travel towers, boom lifts and cherry pickers with boom lengths exceeding 11 metres need to hold the appropriate WorkSafe certificate of competency.

EWPs are subject to the requirements of the Plant Regulations regarding design, installation and use. For further guidance, refer to WorkSafe's *Code of Practice for Plant*. Additional information is provided in AS 2550.10 *Cranes – Safe use – Elevating work platforms.*

6.3.1.3 Mast climbing work platforms

Mast climbing work platforms can be set up in either single-mast or multi-mast configurations.

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

The erection and dismantling of mast climbing work platforms must be carried out (or directly supervised) by a person holding the appropriate WorkSafe rigging or scaffolding certificate of competency.

Mast climbing work platforms are subject to the requirements of the Plant Regulations regarding design, installation and use.

For further guidance refer to:

- WorkSafe's *Code of Practice for Plant*
- AS 2550.16 *Cranes – Safe use mast climbing work platforms.*

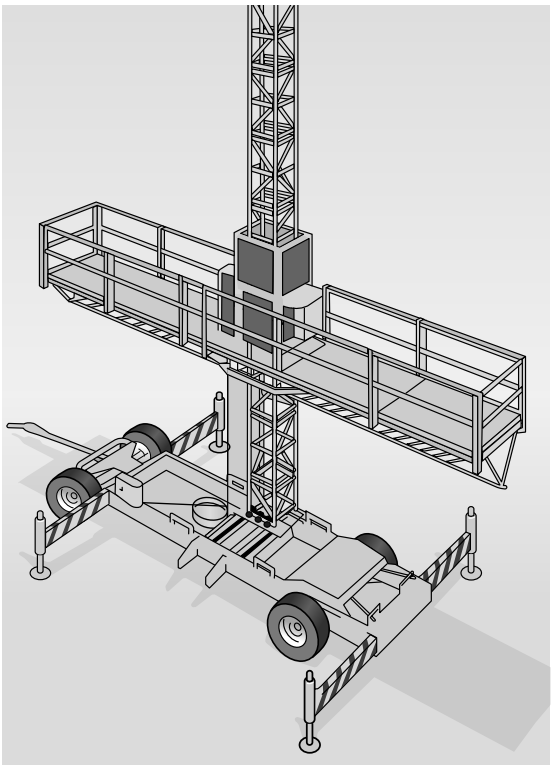


Figure 4 A typical mast climbing work platform

6.3.1.4 Forklift truck work platform

The only safe way to work at height from a forklift truck is in a purpose-designed work platform.

Work platforms should only be used on forklift trucks that are designed for their use.

Platforms should have:

- a floor, guardrails on the front and on both sides, and a back which should guard people from moving parts of the mast
- clearly visible duplicate independent locks – such as tine pins and tilt locking systems – to secure the platform in the correct position
- a clearly marked notice stating the safe working load limit of the platform and other information on safe use.

The forklift operator must hold the appropriate WorkSafe certificate of competency.

For further guidance on industrial lift trucks, refer to:

- AS 2359.1 *Powered industrial trucks: General requirements*
- AS 2359.2 *Industrial trucks* (known as the SAA Industrial Truck Code) – *Operation.*

6.3.1.5 Work boxes (dog boxes)

A work box is a personnel carrying device, designed to be suspended from a crane.

The crane's free fall facility should not be able to be operated in the hoist motion while the crane is supporting a work box carrying people.

Mobile cranes (other than track mounted types) should be blocked at all times when using a work box.

People using the work box should only be allowed to enter or leave the work box from the ground or solid construction. People using the work box should wear a safety harness and lanyard[5] attached to the safety harness anchor point or the crane hook.

The crane operator must have the appropriate WorkSafe certificate of competency and at least one of the workers in the box must be a certificated dogman or rigger.

For further guidance, see:

- WorkSafe's *A Guide to Rigging*
- AS 2550.1 *Cranes, hoists and winches – Safe use – General requirements.*

5 A lanyard is a line that may include a shock-absorbing element – used to connect a harness to an anchorage point or static line in situations where there is a risk of a free fall.

6.3.1.6 Portable or mobile fabricated platforms

These are usually designed for specific tasks, for example, formwork and concreting for columns and work on structural steel.

Figure 5 Mobile fabricated column formwork platform

6.3.1.7 Step platforms

Commercially available step platforms are extremely stable and provide a much larger work surface than a stepladder. Some models are collapsible and adjustable to heights above 2 metres.

6.3.1.8 Purlin trolleys

Trolleys designed to travel on top of purlins (horizontal beams running along the length of a roof) that support materials and/or roof workers may be suitable for use where roof coverings are being installed (generally on larger projects). Before placing the purlin trolley on the roof structure, it should be established that the roof structure is suitable for the particular purlin trolley and operational loads. Engineering advice will need to be obtained.

For the safe erection and use of purlin trolleys, it is recommended that:

- trolleys be provided with a holding brake and a device to prevent their inadvertent dislodgment from supporting purlins
- fall protection be provided at all times to people working from the purlin trolley, and where possible this should be done by using guardrails; if this is not practicable, a safety harness anchored to the trolley should be provided and used.

Where an individual fall arrest system is to be used in conjunction with the purlin trolley, the trolley should be provided with suitable safety harness anchorage points complying with AS/NZ 1891 *Industrial fall-arrest systems and devices*. All people using individual fall arrest systems should be adequately trained and supervised.

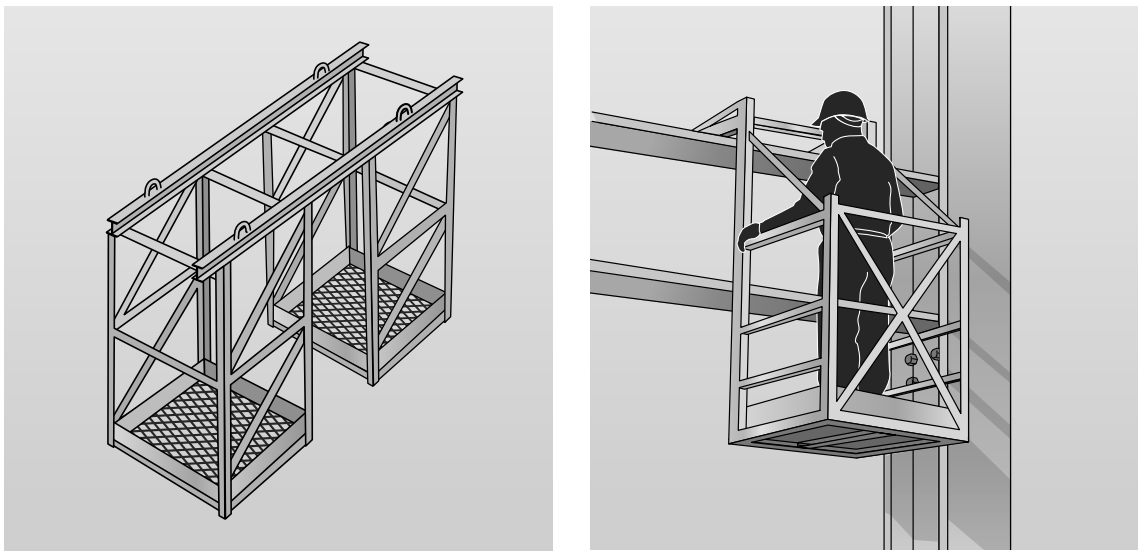


Figure 6 Fabricated hung scaffold – purpose-designed temporary structures that are anchored to a permanent structure to support a working platform

6.3.2 Perimeter protection

6.3.2.1 Perimeter screens

Perimeter screens that are purpose-designed for the building provide a high level of protection. Some screens incorporate prefabricated formwork to enable the casting of perimeter edge beams or stop ends for the edge of the floor. They may also be designed to cover 2 or more floors and have trailing screens attached to protect the formworkers on lower levels while they are stripping the formwork and installing back propping. The screens normally extend 1 floor above the floor that they are supported from and the top of the screen must be high enough to provide perimeter protection for the floor that is to be built. This provides protection above the next floor to be built prior to anyone having to access the floor or formwork deck. They provide secure protection for workers and prevent any debris or building materials from falling out from the building.

Figure 7 Perimeter screens secured by props

6.3.2.2 Perimeter guardrailing

Guardrails may be used to provide effective fall protection at:

- the perimeters of building or other structures
- the perimeters of skylights or other fragile roof materials
- openings in floor or roof structures
- edges of mines, shafts or other excavations.

The guardrail system should:

- be 900–1100 mms above the working surface
- incorporate a mid-rail or mesh panels
- incorporate a toeboard
- be designed to withstand loads not less than those set out in AS 1657 *Fixed platforms, walkways, stairways and ladders – Design, construction and installation*. Appendix 3 sets out the maximum post spacing and the minimum dimensions of components required for timber guardrailing at the perimeter of horizontal surfaces.

Before using a guardrail system, employers should consider how the system can be erected and dismantled safely and the factors that will influence the load on the guardrail. The force applied from the momentum of a falling person, the pitch of the roof and the length of the rafter to which the guardrail is attached will determine if guardrailing is appropriate. Further advice on the design and construction of guardrails for sloping surfaces may be found in AS/NZS 4994 *Temporary roof edge protection for housing and residential buildings*.

Figure 8 Temporary guardrail used to replace mesh to enable work to take place on the curtain wall securing bolts

Steep roofs

Where the slope of the roof exceeds 35 degrees, the roof is an inappropriate surface to stand on. Perimeter guard rails and catch platforms are inappropriate measures to protect workers on a steeply sloping roof.

In these circumstances, roof workers need a system to prevent sliding and to prevent falls from the perimeter, comprising one or more of the following:

- aerial access equipment, such as a cherry picker
- a work positioning system, such as travel restraint or industrial rope access
- a scaffold platform, located at the roof edge
- a roof ladder.

Proprietary systems should be configured, installed, used and dismantled in keeping with the manufacturer's instructions.

6.3.2.3 Barriers to restrict access

Barriers should be used to cordon-off elevated areas including roofs and balconies where edge protection is not provided and people are not permitted to access. The barriers should be secure and restrict access to authorised people only. Signage should be erected which warns against entry to those areas.

Barriers should be placed at least 2 metres in from any unprotected edge or opening. They should be highly visible and capable of remaining in place during adverse weather conditions.

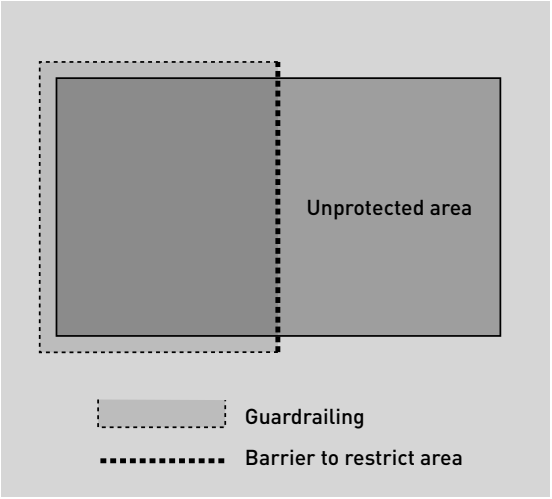


Figure 9 Plan of roof showing barrier restricting access

6.3.3 Safety mesh

Safety mesh is designed to prevent internal falls through a roof, which is one of the most common fall problem in the construction industry. If securely fixed, safety mesh provides fall protection for roof installers and offers long-term protection against falling for maintenance and repair workers. Where existing safety mesh is to be used to control the risk of workers falling, the integrity of the mesh and its fixings should be verified by a competent person prior to use.

Safety mesh **does not** control the risk of perimeter falls or through penetration hazards. Therefore, safety mesh should always be used in conjunction with appropriate edge protection, guard rails or fall arrest systems and devices. Used in conjunction with these control measures, safety mesh is the preferred system for protection against falling for workers laying roof sheets (see section 7).

Appendix 5 provides further guidance on the installation of safety mesh.

6.4 Work positioning systems

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. It includes industrial rope access systems, travel restraint systems and drainers' hoists. Work positioning systems require a higher level of operator competency and supervision than control measures which are higher on the hierarchy of control (see section 4.4.1). Accordingly they should only be used where it is not practicable to use higher order controls.

6.4.1 Industrial rope access systems

Industrial rope access systems (IRAS) are used for gaining access to, and working at, a workface, usually by means of vertically suspended ropes. Although fall arrest components are used in the industrial rope access system, the main purpose of the system is to gain access to a work area rather than to provide backup fall protection.

Industrial rope access systems require a high level of competency on the part of the user and supervisors to ensure safe use. Users, including supervisors, should undertake a competency based course of training such as those approved by the Australian Rope Access Association (ARAA) or equivalent.

For further guidance, see:
- AS/NZS 4488.1 *Industrial rope access systems – Specifications*
- AS/NZS 4488.2 *Industrial rope access systems – Selection, use and maintenance*
- ARAA Industry Code (September 2000) published by the Australian Rope Access Association.

6.4.2 Travel restraint systems

A travel restraint system prevents the user from approaching an unprotected edge on a building or structure. Generally, the system consists of a safety belt or harness that is connected by a lanyard to a suitable anchorage point or static line. The system must be set up to prevent the wearer from reaching the edge.

Where a temporary roof anchor is used as an anchorage for a travel restraint system it must be installed in accordance with the manufacturer's or designer's instructions.

The roof or other building component to which an anchor is to be attached must be checked by a competent person to verify that it is suitable for supporting the anchor.

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

6.5 Fall injury prevention systems

A fall injury prevention system means equipment and/or materials that are intended to prevent, or reduce the severity of an injury to a person if a fall does occur. It includes industrial safety nets, catch platforms and safety harness systems (other than a travel restraint system).

6.5.1 Safety nets

Safety nets can provide a satisfactory means of protection while allowing workers maximum flexibility of movement.

Employers should ensure that:
- workers installing the nets are protected from falling; ideally, a mobile work platform (cherry picker, scissor lift) would be used, but where such mechanical access is not possible the workers should have the protection of scaffolding or a safety harness and life line
- nets are hung as close as is practicable to the underside of the work area
- the safety nets are installed with sufficient clearance to prevent contact with the surface below when subject to use
- when erected, perimeter nets project horizontally a minimum of (2 + H/5) metres beyond the outermost working point above the net, where H = the vertical distance in metres between the net and the outermost working point above; in a normal roofing situation this would mean an outward extension of approximately 2.5 metres
- nets are inspected immediately after installation, relocation or repair
- nets are inspected daily for cuts and damage from abrasions, chemicals or heat; repairs should be made before any unprotected work above the net is resumed
- nets are properly stored; this means hung or folded on pallets in dry, shaded areas with good air circulation
- combustible material does not accumulate in suspended nets; when welding or oxy cutting is being performed, nets should be examined to ensure that the welding slag has not caused any damage.

For further guidance on safety nets, see:
- WorkSafe's *A Guide to Rigging*
- AS 4576 *Guidelines for scaffolding*.

6.5.2 Catch platforms

A catch platform is a temporary platform located below a work area to catch a worker. The platform should be of robust construction and designed to sustain the maximum potential impact load.

Scaffolding components may be used to construct a mobile catch platform. Where this method is used, the platform should:
- incorporate a fully planked-out deck as close as possible to (and in no case more than 2 metres below) the level at which work is proceeding
- be positioned to maintain a minimum of 2 metres beyond all unprotected edges of the work area
- be at least the width of the area being removed (for example in roof laying work).

Frame trestle scaffolds and split head trestle scaffolds can provide simple and inexpensive catch platforms. The latter is particularly effective in voids and stairwells.

6.5.3 Individual fall arrest systems (IFAS)

Individual fall arrest systems are intended to safely stop a worker falling an uncontrolled distance and reduce the impact of the fall. IFAS is an assembly of interconnected components comprising a harness connected to an anchorage point or anchorage system either directly or by means of a lanyard. They can be used where workers are required to carry out their work near an unprotected edge.

IFAS should only be used if it is not practicable to use a risk control measure that prevents a fall to a lower level. An IFAS requires considerable skill to use safely, and in the event of an arrested fall, it is likely to cause some physical injury to the user. People using IFAS should wear head protection to protect them in the event of a fall.

Appendix 4 provides detailed guidance on the selection, use and maintenance of IFAS. This appendix also discusses potential hazards associated with their use, i.e. damage to the line from contact with an edge and the pendulum effect.

For further guidance on IFAS, see:

- WorkSafe's *A Guide to Rigging*
- WorkSafe's Guidance Note *Fall Arrest and Travel Restraint Systems*
- AS 3828 *Guidelines for the erection of building steelwork*
- AS/NZS 1891.4 *Industrial fall-arrest systems and devices – Selection, use and maintenance*.

Information, instruction and training for workers using IFAS

Workers required to use IFAS must be trained and instructed in:

- correct fitting and attachment of safety harnesses
- dangers of using incompatible hardware
- inspection, maintenance and storage of equipment
- correct anchorage, installation and use of the system.

Workers required to use IFAS should be assessed for their competency in the safe use of the equipment on completion of the training program.

Rescue of workers who are using IFAS

A fall rescue plan should be developed before setting up these systems. Workers using IFAS should not work alone.

Only install and use IFAS in places where it is possible to provide prompt assistance or rescue if required.

6.6 Portable ladders

Portable ladders are a relatively low-cost option for people intending to undertake work at height. Their affordability combined with the ease with which they may be transported and relocated has resulted in ladders being used extensively in general construction work. However, many falls take place when people are working from ladders.

Under the Regulations, which only apply where persons are exposed to a fall hazard of more than 2 metres, portable ladders may only be used where other methods of working at height are not practicable. The fall height is the distance from the level at which a person's feet are supported on the ladder to the level below. To avoid falls from ladders it is necessary to ensure a risk assessment is carried out where it is intended undertake any such work from a ladder.

Further guidance on the use of ladders where persons are exposed to the risk of a fall of up to 2 metres is given in Part 3.

6.6.1 Duties of employers (including subcontractors with employees)

In addition to the relevant requirements set out in section 4.4, the Regulations require that where an employer chooses a fixed or portable ladder to control the risk of a fall, the employer must ensure that the ladder is:

- appropriate for the task to be undertaken
- appropriate for the duration of the task
- set up in a correct manner.

6.6.2 Selection of ladders

Employers must make sure that portable ladders are correctly selected for the task to be undertaken. In doing this, employers must have regard to the duration of the task, the physical surroundings of where the task is to be undertaken and the prevailing weather conditions. For example, metal ladders or metal reinforced ladders should not be used for live electrical work.

Typically, ladder use for construction work involves repetitive, high volume use and handling, requiring them to be of robust design and construction. **Ladders used for construction works should be industrial grade, not domestic grade.**

6.6.3 Safe use of ladders

Any ladder used at a workplace must be set up on a surface that is solid and stable, and set up so as to prevent the ladder from slipping.

Slipping of ladders can be prevented by:

- placing single and extension ladders at a slope of 4 to 1, and setting up stepladders in the fully opened position
- securing single and extension ladders at both the top and bottom.

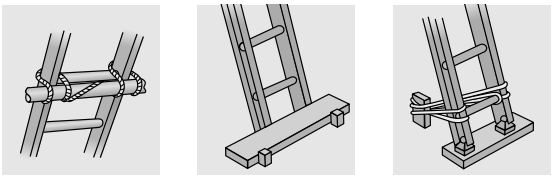


Figure 10 Some effective ways of securing a ladder

People using ladders should not:

- handle or use ladders where it is possible for the worker or the ladder to make contact with powerlines
- use metal or metal reinforced ladders when working on live electrical installations
- set up the ladder in places, such as driveways and doorways, where a person or vehicle could hit it without appropriate safeguards such as erecting a barrier or locking the door shut
- use a ladder near the edge of an open floor, penetration, or on scaffolding to gain extra height
- over-reach (the worker's belt buckle should be within the ladder stiles throughout the work)
- use any power (air, hydraulic, electric or battery) equipment or tool, specifically designed to be operated with two hands, such as concrete cutting saws and circular saws
- use tools which require a high degree of leverage type force which, if released, may cause the user to over balance or fall from the ladder such as stillsons or pinch bars
- carry out work such as arc welding or oxy cutting
- work over other people
- allow anyone else to be on the ladder at the same time.

Except where a pole strap (or similar device providing the user with full body support) is used, any person using a ladder should not:

- face away from the ladder when going up or down, or when working from it
- stand on a rung closer than 900 mm to the top of a single or extension ladder
- stand higher than the second tread below the top plate of any stepladder.

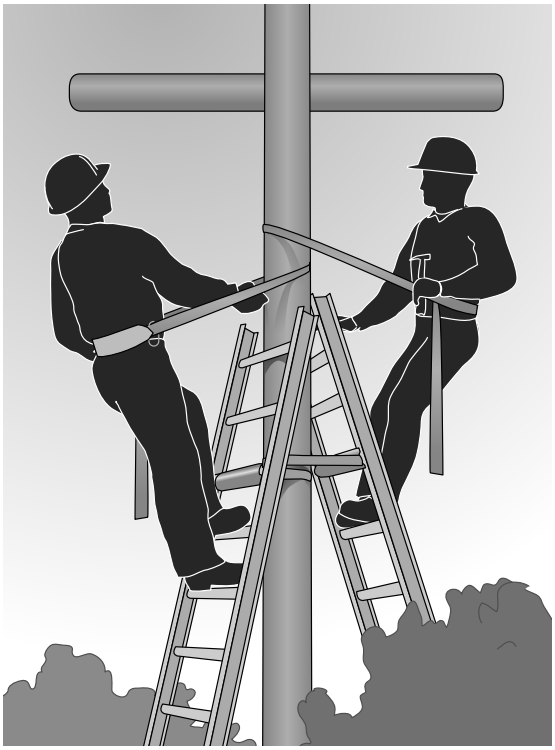


Figure 11 Pole straps used in association with portable ladders to provide fall protection

Where possible, ladders being used as access should be set up at right angles to the working surface to allow workers to step off the ladder rather than having to step around or over the ladder.

6.6.4 Ladder maintenance

Ladders should be regularly inspected by a competent person. Ladders with any of the following faults should be replaced or repaired:

- timber stiles warped, splintered, cracked or bruised
- metal stiles twisted, bent, kinked, crushed or with cracked welds or damaged feet
- rungs, steps, treads or top plates which are missing, worn, damaged or loose
- tie rods missing, broken or loose
- ropes, braces, or brackets which are missing, broken or worn
- timber members that, apart from narrow identification bands, are covered with opaque paint or other treatment which could disguise faults in the timber.

6.7 Administrative controls

6.7.1 General

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

They may be used to support other control measures that are put in place. For example, work procedures may be needed to ensure the safe use of temporary work platforms, devices that prevent a fall to a lower level, fall injury prevention systems and ladders. You may also need administrative controls to limit the time workers are exposed to the fall hazard and/or the number of workers involved in the task.

As an employer, you should consider involving contractors and employees in the development of administrative controls. People who perform a task regularly often have a good understanding of the risks involved.

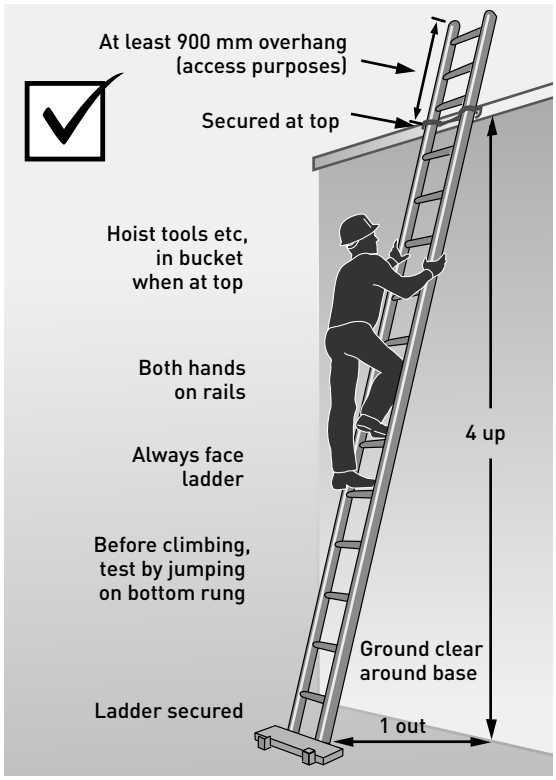


Figure 12 Example of acceptable ladder use

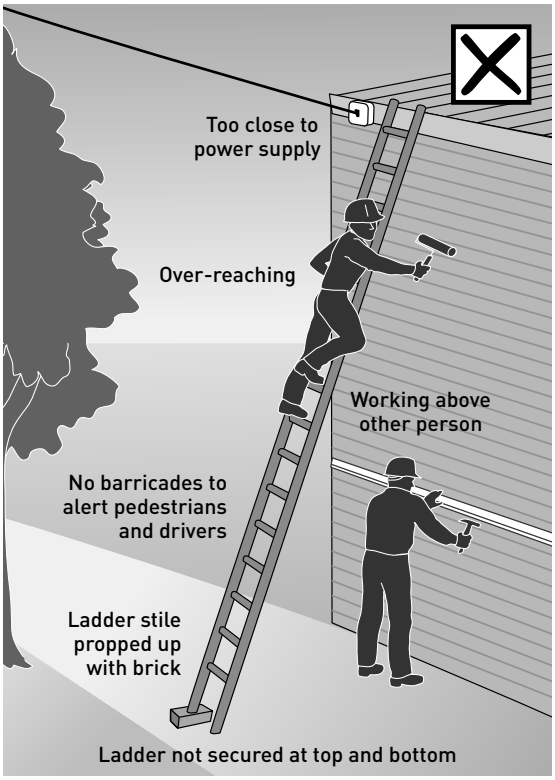


Figure 13 Example of unsafe ladder use

Administrative controls may include:

(a) No Go areas

"No Go" areas can be an effective method of making sure people are not exposed to fall hazards. They should have adequate signage to warn against access to the hazardous area, such as Figure 14.

Figure 14 Example of signage for "No Go" areas

Employers should provide relevant information to workers on site, and adequate supervision to ensure that no worker enters a No Go area.

(b) Permit systems

Permit systems ensure that only competent persons are exposed to the hazard. Examples include:

- tagging all access points to a scaffold to prevent unauthorised access during erection and dismantling. Only certified scaffolders permitted on an incomplete scaffold
- requiring permits for access to areas where independent fall arrest or travel restraint systems must be used.

(c) Organising and sequencing work

Make sure that the work is organised so that people do not interfere with, or 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. Plan the work so tasks are not performed for extended periods from a ladder, or so that work at height is minimised in extremely hot or cold weather.

(d) Safe work procedure

An administrative control may be as simple as a safe work procedure that describes the steps involved in safely undertaking a task. It may also include any particular training, instruction and the level of supervision required.

A safe work procedure can be generic and applicable to a task that is routinely or repeatedly carried out.

6.7.2 Recording the administrative control

If administrative controls are used as the sole means of reducing the risk associated with a particular task, employers must make sure that details of the task and controls put in place are recorded. These records must be kept until the work covered by the administrative control has been completed. Appendix 6 demonstrates how to record a safe work procedure.

It is not necessary to record the administrative control for every task at all workplaces under the employers' control. A single record of the administrative control – such as a safe work procedure – could apply to a task that is routinely or repeatedly carried out. However, the record must make it clear to which particular task the administrative control applies.

If you are relying on administrative controls, it will be necessary to provide a high level of supervision to ensure that the safe work procedure is being adhered to. You should regularly review the effectiveness of the procedures.

7. ROOF WORK

7.1 Roof laying

This section provides guidance on the laying of metal deck and similar roofing. Subject to a site specific risk assessment, an acceptable method of preparing and laying roof sheets on a portal frame type structure is as follows.

1. Install roof mesh and handrails in accordance with section 7.2 and Appendix 5. Where any area of the roof is not to be provided with mesh, such as box gutters, then other means of fall protection should be installed.
2. Install access tower. The access tower should be located as close as possible to the load position of the first pack of sheets (see Figure 15).

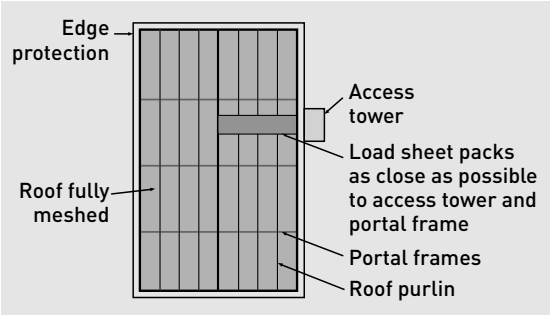


Figure 15 Roof access

3. Load first pack of sheets as close as possible to access tower.

   Where the crane operator requires assistance of a worker at the ridgeline, to control the amount of swing of the load, then this worker may gain such access by walking up the main rafter of the portal frame. This may only occur after the installation of the roof mesh as per 1 above. Under no circumstances should workers gain access across the roof by "purlin hopping" from one purlin to the next.
4. Load subsequent packs of sheets. All sheet packs should be loaded as close as possible to a portal frame. Where the pitch of the roof is not greater than 15 degrees, access between packs of sheets only, may be provided along the eave purlin using the guardrail to maintain balance (see Figure 16). The eave purlin is **not** to be used as general access around the roof.
5. Loose lay roof sheets across bay, install insulation and fix sheets. As an employer, you should ensure that the roof sheets are laid out consecutively to provide a progressive working platform for the workers. To accommodate the laying of insulation, a gap may need to be left between roof sheets. Where, in order to complete the roof fixing procedure, workers are required to cross this gap by stepping onto the purlin, then the spacing between sheets should be minimised.

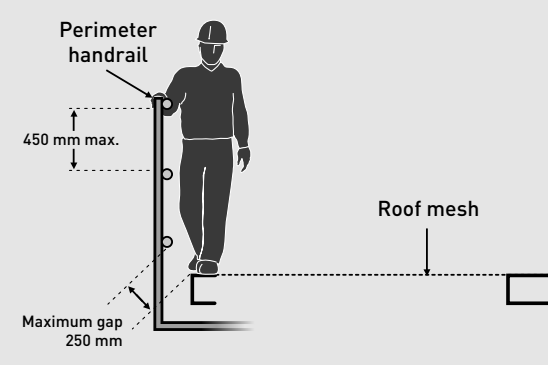


Figure 16 Access between roof sheet packs

7.2 Perimeter guardrailing

The installation of guardrailing should be generally in accordance with section 6.3.2.2 and include the following:

- toeboards or mesh infill to prevent tools, materials and debris falling from the roof, unless a No Go Zone is established below the area where roofing works are being carried out and the slope of the roof is less than 15 degrees
- an additional midrail to ensure the nominal clear distance between rails does not exceed 450 mm
- a third rail or in-fill panel where the distance, through which a person may fall, between the work surface and the mid-rail exceeds 250 mm.

7.3 Roof access

The employer has a responsibility to ensure that the access from the ground to the actual work area is safe and without risk to health.

When assessing access requirements, you should take into account the tools and equipment the roof worker may be required to carry to and from the work site.

Where temporary ladders are used for access, ensure that:

- the ladders are secured against displacement at the top and are provided with non-slip feet
- workers using the ladder have a safe place to stand when alighting from the ladder
- the stiles of the ladder extend at least 900 mm above the stepping-off point
- metal or wire bound ladders are not used in the vicinity of electrified powerlines.

Where access to a roof via a ladder located within a horizontal distance of 3 metres or a vertical distance of 3 metres from powerlines, the employer must, prior to commencing work, notify the relevant power company and obtain its written permission to proceed.

Where access is via a permanently installed ladder, the ladder and any associated platforms and walkways should comply with AS 1657 *Fixed platforms, walkways, stairways and ladders – Design, construction and installation*.

For new roof installations or where extensive repair or replacement of existing roofs is planned, it is recommended that where:

- the eaves height is between 6 and 15 metres above the ground, a ladder access tower be provided
- where the eaves height exceeds 15 metres, a personnel and materials hoist be provided as well as a ladder access tower.

8. FRAGILE ROOFS

Roofs should be assumed to be covered with a brittle or fragile material and the precautions recommended in this section should be adopted, unless they are specifically identified as metal and in sound condition.

Where a roof or part of a roof covering comprises fragile or brittle material, the employer should provide a warning sign at any place where workers can gain access to the roof. An appropriate sign is shown in Figure 17.

Figure 17 Signage warning of fragile roof

Where it is necessary for work to be carried out on a roof containing fragile materials, the employer should ensure that the underside of the roof is inspected to determine the extent of fragile roof material, the existence of any safety mesh and the structural soundness of the roof and any safety mesh and its fixings.

To enable work to be carried out safely on or adjacent to any part of a roof sheathed in brittle material, employers should provide:

- temporary walkways (if permanent walkways are not provided); the walkways should be at least 450 mm in width and should incorporate a guardrail; where the slope of the roof exceeds 1 to 6, cleats should be fixed to the top side of the walkway planks; the walkway should be adequately secured
- temporary roof ladders if the roof is steeply sloping (i.e. in excess of 35 degrees); these should be used in conjunction with an individual fall arrest device.

9. OTHER HAZARDS

Regulation 209 places a duty on employers to ensure "that the installation, erection or dismantling of the plant used to control risk is carried out in such a manner so as to reduce, so far as is practicable, any risk while that (work) is being carried out".

9.1 Powerlines

In construction, there is often a risk of plant being used at height coming into contact with overhead electrical powerlines. This risk must be assessed and controlled.

The Office of the Chief Electrical Inspector and WorkSafe have endorsed guidelines for people working near powerlines. Employers undertaking work in accordance with the guidelines are deemed to be meeting their OHS duties in respect of the electrical hazard. Depending on the type of plant, the work to be undertaken and the proximity of the powerlines, the guidelines prescribe a combination of the following control measures:

- safe work systems
- use of a spotter
- permission, with specified conditions, from the relevant distribution business.

Note: These provisions are not applicable to workers in or engaged by companies of the Victorian Electricity Supply Industry.

Further detailed information on the guidelines may be obtained from WorkSafe Victoria or the Office of the Chief Electrical Inspector.

10. CASE STUDY: FORMWORK

Introduction

Formwork is defined in Australian Standard AS 3610 *Formwork for concrete* as "the surface, supports and framing used to define the shape of concrete until it is self-supporting".

Most modern multi-storey construction methods make extensive use of concrete. This can be in the form of precast concrete or concrete poured *in situ*. Precast concrete usually consists of precast components cast off site, which are then delivered to site by trucks and lifted by crane into location. Concrete poured *in situ* consists of a formwork system which provides the casting mould for the concrete, reinforcing steel – which is placed into the casting mould to provide tensile strength, and concrete which is poured or pumped into the mould in a stiff liquid form.

Both methods can create risks of falls. Following are some simple control methods that have been developed by construction companies to eliminate or minimise the risk of falls in the erection of typical formwork.

Perimeter protection

The first step is to determine what kind of protection is to be provided at the perimeter of the building. Several common methods are used depending on the building structure. The decision on the most suitable method should be taken in consultation with the employees' health and safety representative(s). All available options should be considered and evaluated, particularly those that provide the most secure method of perimeter protection. Perimeter screens and shutter systems provide protection against falling debris and construction material, as well as eliminating the risk of falling at the perimeter. Perimeter scaffolding covered in shadecloth provides similar protection in addition to providing working platforms from which perimeter beams and stop ends can be built. Some buildings are designed with precast walls that are installed on the perimeter to provide protection prior to erection of the formwork decks.

(a) Perimeter screens

Perimeter screens that are purpose-designed for the building provide a high level of protection. Some screens incorporate prefabricated formwork to enable the casting of perimeter edge beams or stop ends for the edge of the floor. They may also be designed to cover 2 or more floors and have trailing screens attached to protect the formworkers stripping the formwork and installing back propping on lower levels.

The screens normally extend 1 floor above the floor that they are supported from and the top of the screen must be high enough to provide perimeter protection for the floor that is to be built. This provides protection above the next floor to be built prior to anyone having to access the floor or formwork deck. They provide secure protection for workers and prevent any debris or building materials from falling out from the building. In the Regulations' hierarchy of control, perimeter screens are regarded as a device that prevents a fall to a lower level.

- Perimeter screens should be designed to withstand all imposed loads, including wind loads. They should be designed so that all components are integrated into the system and can not fall during lifting of the screens.
- Perimeter screens should be put in place prior to the erection of the formwork deck.
- The formwork deck is built within the protection of the perimeter screen. After the concrete floor has been poured and cured, a guardrail system is erected inside the screen on the newly built floor at the perimeter of the building. The screens are then lifted to the next level. During lifting, workers are protected by the newly erected perimeter guardrails. Relocating of the screens can be carried out safely from behind the protection of the perimeter guardrail. The sequence is then repeated.
- Perimeter screens should never be lifted until the perimeter guardrail system has been placed.

Figure 18 View of perimeter screens from the outside

(b) Precast concrete panels that finish at least 900 mm above the finished floor height

The use of precast concrete panels can eliminate much of the work involved in the *in situ* placing of concrete. Designers should consider designing panels that finish at least 900 mm above the finished floor height, which will ensure that perimeter protection is in place prior to the floor being built. This provides an elimination control as the task of pouring concrete for the perimeter walls is eliminated. The panels also provide an engineering control for the provision of fall protection at the perimeter of the building.

- Perimeter wall panels often have openings for windows and doors. Prior to erection all openings should be securely covered.
- Ladders should not be used to attach push-pull props to the panel on the perimeter of the building. Push-pull props can sometimes be attached by suspending the panel on the crane alongside the building at insert level. The tops of the props are attached and the crane then raises the panel to its erection level. Scissor lifts can also be used for attaching props. During the task, workers are fully protected on the perimeter by the previously erected panel.

(c) Precast concrete panels that finish at floor level

Panels that finish at floor level need carefully planned systems of work to ensure that protection can be maintained at the perimeter of the building at all times. Higher levels of supervision are needed to ensure that the agreed work methods are closely followed. Several methods of fall protection have been developed in addition to those below. The preferred systems are those that provide physical protection at the perimeter of the building at all times.

- Panels can be provided with offset guardrails that are bolted to the inside face of the panel prior to lifting. This method provides protection at the perimeter of the building prior to the construction of the next floor. The offset guardrail allows the next panel to be placed without having to remove the guardrail. After the panel has been placed the redundant guardrail can be removed and reused.

- Panels can be provided with guardrails that slip over the dowels or bolt in to the inserts on the top of the panels. This system can interfere with the lifting chains and often the guardrails are erected after the panel has been lifted into position. The guardrails should be erected from a scaffold or elevating work platform from the finished floor inside the building. The panel provides protection at the perimeter while this task is being carried out. After the formwork deck has been built and the new floor poured, additional guardrails should be bolted to the floor perimeter prior to removing the guardrails from the top of the panels. The next panels can then be safely erected from behind the guardrails.

Conventional frame formwork decks

Formwork frames can be used safely provided careful attention is given to systems of work and sequencing. As this work involves some administrative controls, adequate supervision must be provided to ensure the work is carried out in accordance with the planned system of work.

- Once perimeter protection has been established, the frames can be erected from the floor and the braces attached.
- The frames should then be fully planked out. Planks used for working platforms should consist of scaffolding planks that have been cut to size to allow a small overhang past the frame. They should be cleated underneath to prevent dislodgment. Longer planks may be lapped on top to provided access between frames.
- Screw jacks, "U" Heads, bearers and sub-bearers can all be placed into position from the working platform.
- An access can then be erected to the formwork deck.
- The first sheets of ply can be pushed into location from below.
- The laying of ply should be done in a sequential manner working out from a safe location. Working from a secured section of ply the form workers should slide the ply out in front of them. This can be done in a manner where the workers are always standing on secured ply and the ply being pushed along the bearers in front of them provides protection from the risk of falling forward. The laying of ply should continue across the deck and sequentially forward until the last sheet of ply is butted up against the perimeter protection system. **Ply should never be laid to an open edge without fall protection in place.**
- Where the form deck is to be built in sections, there should be at least one set of frames, sub-bearers and bearers past the last sheet of ply. The bearers provide fall protection when laying the last section of ply. When the last section of ply is laid a guardrail should be installed at a minimum distance of 2 metres from the edge of the formwork section. This avoids anyone having to be near an unprotected edge during the construction of the deck.
- Apart from the formwork carpenters, no other people or loads should be on the deck until all gaps have been covered and all open edges protected by guardrails or perimeter protection such as screens.
- When all gaps have been eliminated, open edges protected and safe access installed, the deck can be considered to be solid construction and all other trades can work without the need for additional fall prevention controls.

The use of administrative controls, i.e. safe systems of work and diligent supervision, is a practicable risk control measure when planking out frames on the interior of the building. It is practicable because workers are not working within 2 metres of an unprotected perimeter edge.

Table forms

The advantage of table forms over conventional frame formwork decks is that the table forms can be placed into position to ensure a stable working deck prior to people having to access the deck.

- Table forms are usually wheeled into position using castors attached to the legs of the frames, or placed into position by crane.
- The work sequence should be planned to ensure that there is a minimum of open edges.
- Start from a safe location such as next to perimeter screens, scaffolding or an adjoining slab. Provide the number of tables needed to complete the section.
- Place the tables as close together as is practicable to avoid wide gaps.
- Once the tables have been located a safe means of access should be erected.

Figure 19 Access to form deck

- Where the tables are to stop short of the edge protection at the perimeter of the building, then guardrails will need to be erected at all open edges (see Figure 20). The guardrails should be placed at a minimum of 2 metres back from the edge to prevent exposure to fall hazards.
- Working outwards from the safe location, progressively install all infill ply to the gaps between tables. At locations such as columns where more extensive infill is required, temporary guardrails may be needed until the infill work can be completed.
- Apart from the formwork carpenters no other people or loads should be on the deck until all gaps have been covered and all open edges protected by guardrails or perimeter protection such as screens.
- When all gaps have been eliminated, open edges protected and safe access installed, the deck can be considered to be solid construction and all other trades can work without the need for additional fall prevention controls.

Figure 20 Table form guardrails set back a safe distance from the open edge

11. DUTIES OF EMPLOYERS UNDER THE OCCUPATIONAL HEALTH AND SAFETY ACT 1985

A fall from almost any height can result in injury. If you fall onto concrete head first, you could die, even if the height of the fall is small. If the ground surface is asphalt or packed earth, a fall of 1 metre has the potential to kill or at least cause serious injury.

Potential falls from heights of 2 metres or less are not covered by the Regulations. The general duties of care under the *Occupational Health and Safety Act 1985* (the Act) apply in these circumstances. If you are an employer, you have a duty under section 21 of the Act to provide and maintain, so far as practicable, a working environment that is safe and without risks to the health of your workers. You are specifically required to provide and maintain plant and systems of work that are, as far as practicable, safe and without risks to health. In other words, risks of falling from heights of up to 2 metres must be controlled.

Assessing the risks of these falls does not need to be complicated. In most cases, you can simply:

- look for the hazards
- decide who might be harmed and how
- if a risk exists, consider ways of doing the task more safely
- take action to eliminate the risk; if it is not practicable to do so, reduce the risk.

12. CONTROLLING RISKS

Some common tasks associated with falls of 2 metres or less are illustrated here, along with methods to control the risks associated with these hazards.

Hazard: Worker using stilts

The use of stilts raises a worker's centre of gravity, making him or her much more unstable and prone to tripping, overbalancing or falling through openings in floors or walls. Guardrails are usually not designed for people on stilts, and will not protect the user from falling. Workers sometimes use an unstable support, such as a stepladder to put on stilts, exposing themselves to the hazard of falling.

For these reasons, it is recommended that stilts not be used to elevate workers. Principal contractors should include in contract documents with their subcontractors a prohibition on the use of stilts on the site.

For more information, see the WorkSafe *Alert Dangers in Using Stilts for Elevated Work*.

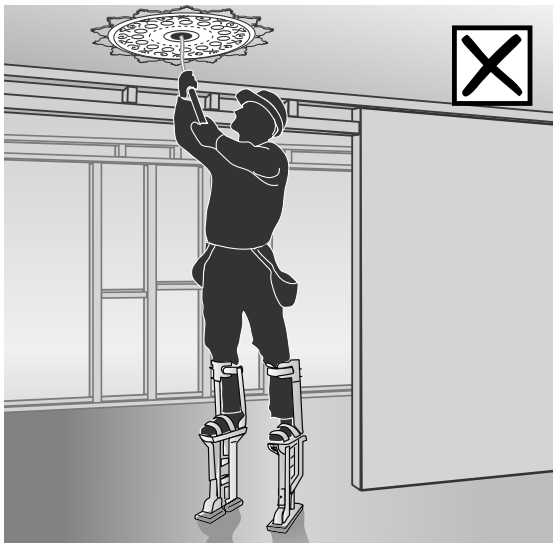


Figure 21 Hazard: plasterers' stilts

Solution: Provide a splithead trestle scaffold

Splithead trestle scaffolds are quick and easy to erect and can be configured in a variety of ways to suit the particular job. They are particularly useful for light and medium duty activities such as plastering, painting and general fit-out and finishing.

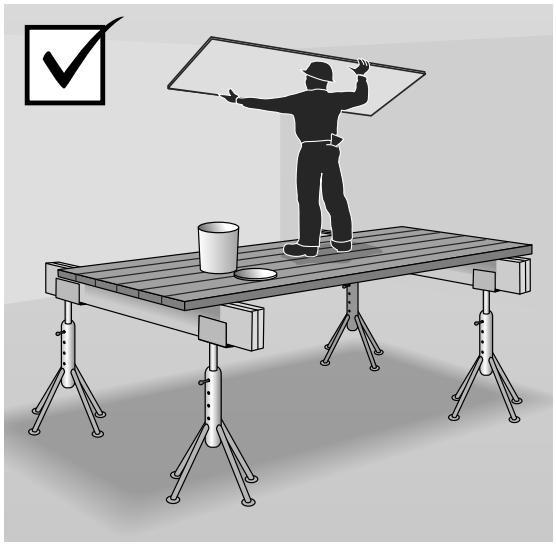


Figure 22 Solution: a splithead trestle scaffold

Hazard: Performing a task from a stepladder

Most ladder-related injuries occur as a result of falls from low heights. Sideways tipping is the cause of most stepladder injuries, and this risk increases as the worker ascends the ladder. In this case, the worker is working above the second tread from the top of the ladder and is at extreme risk of falling. The worker is often working alone and does not have anyone to hold the stepladder to stabilise it.

Solution: Use a step platform

A commercially available step platform provides a safer alternative to a stepladder – especially where the task involves extended periods working at height or restricted vision (such as welding or other hot work). The step platform is extremely stable and provides a much larger work surface than the stepladder. Some models are collapsible.

Figure 23 Hazard: standing above second tread of a stepladder

Figure 24 Solution: a step platform provides a stable work surface

Portable ladders

For general advice on the selection and maintenance of ladders refer to Part 2, section 6.6 of this code.

People using ladders should not:

- handle or use ladders where it is possible for the worker or the ladder to make contact with powerlines
- use metal or metal reinforced ladders when working on live electrical installations
- set up the ladder in places, such as driveways and doorways, where a person or vehicle could hit it. If necessary, erect a barrier or lock the door shut
- use a stepladder near the edge of an open floor, penetration, or on scaffolding to gain extra height
- over-reach (the worker's belt buckle should remain within the ladder stiles throughout the work)
- use any power (air, hydraulic, electric or battery) equipment or tool specifically designed to be operated with two hands and which may require the operator to brace themselves against the high level of torque exerted by the tool
- carry out work such as arc welding or oxy cutting unless step platforms or other temporary work platforms are not feasible and the task is of short duration and a safe work procedure is followed
- use tools requiring the use of both hands and dynamic movement such as axes and crowbars
- use tools which require a high degree of leverage type force which, if released, may cause the user to over balance or fall from the ladder such as stillsons or pinch bars
- work over other people
- allow anyone else to be on the ladder at the same time.

Except where additional and appropriate fall protection equipment is used in conjunction with the ladder, any person using a ladder should **not**:

- face away from the ladder when going up or down, or when working from it
- stand on a rung closer than 900 mm to the top of a single or extension ladder
- stand higher than the second tread below the top plate of any stepladder

A ladder must be set up on a surface that is solid, stable and secure. It must be set up to prevent it from slipping.

Trestle scaffolds

Trestle scaffolds are only suitable for tasks requiring a work platform of 2 metres or less. If a trestle scaffold is used, make sure it is right for the job and set up correctly.

When adjusting the height of a trestle scaffold, make sure that only the purpose-designed pins are used. Do not use nails or pieces of reinforcing bar.

Further guidance on trestle scaffolds is provided in AS/NZS 4576 *Guidelines for scaffolding*. No certificates of competency are required for the erection of these types of scaffolds.

Ladder-bracket scaffolds

Ladder-bracket scaffolds are constructed from single or extension ladders with brackets to support scaffold planks. Use only for very minor tasks where the worker cannot fall more than 2 metres.

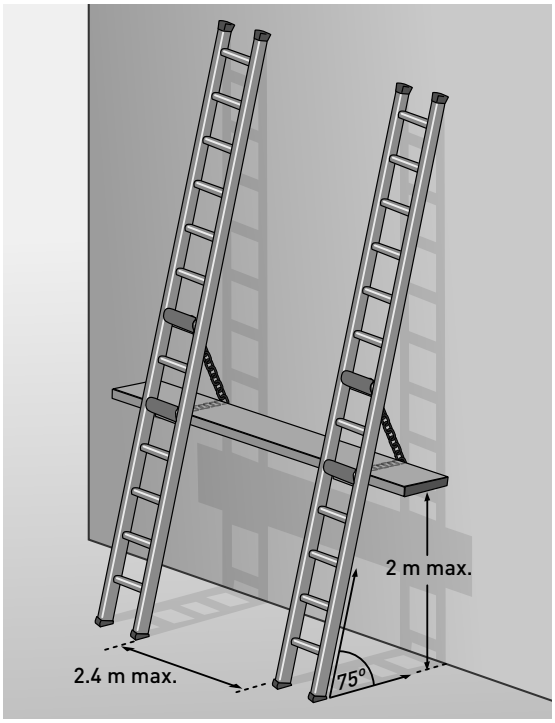


Figure 25 A ladder bracket scaffold

When using ladder-bracket scaffolds, observe the following.

- Only use industrial grade single or extension ladders.
- Pitch the ladders at a horizontal to vertical slope ratio of 1:4.
- Make sure the ladders are firmly footed on a hard level surface.
- Secure the ladders against movement.
- Keep the horizontal distance between brackets to 2.4 metres or less.
- Make sure the planks are genuine scaffold planks in good condition.
- Provide barricades or other suitable controls to prevent traffic damage.
- No more than one person should be supported in any bay of the scaffold.
- Do not stack materials on the working platform.

13. INFORMATION, INSTRUCTION AND TRAINING REQUIREMENTS UNDER THE ACT

Under the Act, you must provide your workers with sufficient information, instruction and training to enable them to work safely and without risking their health. Where workers are exposed to potential falls of 2 metres or less, information, instruction and training should explain:

- the hazards and risks associated with work performed at these heights
- how to follow health and safety procedures associated with this work
- the reasons fall protection measures have been set in place and how to use them properly.

Those supervising the work should also receive training.

The amount and type of information, instruction and training you need to provide will depend on the risk involved. You should also take into account the complexity of the work procedures and type of fall protection measures adopted.

APPENDIX 1
WHAT IS A CODE OF PRACTICE?

What is a code of practice?

An approved code of practice gives practical guidance on how to comply with a general duty under the Act or a specific duty under the Regulations. Compliance with the provisions in an approved code of practice, where relevant, may constitute compliance with the provisions of the Act or Regulations to which the code is giving practical guidance.

Generally, an approved code of practice contains various courses of action which are designed to achieve health and safety standards required by the Act and Regulations. Codes usually contain a number of options for meeting standards.

Who do they apply to?

Codes of practice may be written to provide practical guidance for any person placed under obligation by the Act or its Regulations, for example, occupiers, manufacturers and employees.

Each approved code of practice will state the people for whom the guidance is intended.

What is their legal status?

The provisions in a code are not mandatory. That is, a person may choose to comply with the relevant provision of the Regulations in some other way, provided that the method used also fulfils the requirements of the Regulations or the Act. A person or company cannot be prosecuted simply for failing to comply with an approved code of practice.

However, in legal proceedings, failure to observe a relevant approved code of practice can be used as evidence that a person or company has contravened or failed to comply with the provisions of the Act or Regulations. If a person has not adopted the method described in the code, it is up to that person to show that the legal requirement has been met by an alternative method. Therefore, an approved code of practice should be followed, unless there is an alternative course of action that would also fulfil the requirements of the Act or Regulations.

A WorkSafe inspector may cite an approved code of practice as a means of remedying alleged non-compliance when issuing an improvement notice or a prohibition notice. Similarly, a health and safety representative may cite an approved code of practice in a provisional improvement notice when providing directions as to how to remedy an alleged non-compliance.

APPENDIX 2
PUBLICATIONS INCORPORATED IN THIS CODE

The following is a list of technical standards incorporated in this code to provide additional guidance on compliance with particular duties.

AS 1577	*Scaffold planks*
AS 1657	*Fixed platforms, walkways, stairways and ladders – Design, construction and installation*
AS/NZ 1891.1	*Industrial fall-arrest systems and devices – Safety belts and harnesses*
AS/NZS 1891.2	*Industrial fall-arrest systems and devices – Horizontal lifeline and rail systems*
AS/NZ 1891.3	*Industrial fall-arrest systems and devices – Fall-arrest devices*
AS/NZS 1891.4	*Industrial fall-arrest systems and devices – Selection, use and maintenance*
AS 2359.1	*Powered industrial trucks: General requirements*
AS 2359.2	*Industrial trucks (known as the SAA Industrial Truck Code) – Operation*
AS 2550.1	*Cranes – Safe use – General requirements*
AS 2550.10	*Cranes – Safe use – Elevating work platforms*
AS 2550.16	*Cranes – Safe use – Mast climbing work platforms*
AS 3828	*Guidelines for the erection of building steelwork*
AS/NZS 4488.1	*Industrial rope access systems – Specifications*
AS/NZS 4488.2	*Industrial rope access systems – Selection, use and maintenance*
AS/NZS 4576	*Guidelines for scaffolding*
AS/NZS 4994	*Temporary roof edge protection for housing and residential buildings*

What is the effect of incorporating documents in a code of practice?

Incorporation of a published technical standard in a code of practice has the effect of making that standard form part of the code. The standards listed in this code provide guidance on how to comply with the *Occupational Health and Safety (Prevention of Falls) Regulations 2003*.[6]

It is important to note that the standards themselves have not been written specifically as guidance on how to comply with the duties under the Regulations. As such, following the provisions of an incorporated standard may not constitute full compliance with the relevant duties. This is because the standard itself may not deal with all the matters relevant to hazard identification, risk assessment and risk control for the particular situation. Appropriate judgement needs to be exercised in such circumstances.

To the extent that provisions of an incorporated standard are relevant to a duty under the Regulations, following those provisions (as is the case with any code provision) is regarded as compliance with the relevant duty under the Regulations.

However, as with other code provisions, provisions of an incorporated standard are not mandatory – alternative measures may be used in order to comply with the duties under the Regulations.

It should be noted that many of the published technical standards listed in this code contain provisions expressed in a mandatory manner, that is, they state that a person "shall" do some action. The mandatory provisions in the published technical standards are not mandatory for the purpose of the code. Appropriate judgement needs to be exercised in such circumstances and the Regulations should be consulted to determine the regulatory requirements in Victoria.

APPENDIX 3
TYPICAL COMPONENT DIMENSIONS AND SPACINGS FOR GUARDRAILING

This appendix provides recommendations for the minimum dimensions of components as well as maximum spacings for timber guardrailing at the perimeter of working platforms, floors or other horizontal surfaces.

The minimum dimensions should be used where guardrailing is not specifically designed and tested in accordance with AS 1657.

TABLE 2: TIMBER GUARDRAILS

Guardrail size depth x width (nominal sizes) (mm)	Maximum guardrail span (m)	
	F8 HW or MGP 12 seasoned pine	F7 pine
100 x 38	2.7	NA
100 x 50	3.5	NA
2 nos 90 x 35**		3.5

**Timber members to be nailed together at maximum 300 mm intervals in 'T' or 'L' sections

TABLE 3: TIMBER GUARDRAIL POSTS

Timber guardrail posts Minimum nominal sizes and gradings (maximum span of guardrails less than 3.5 m)	
Bending about weak axis	**Bending about strong axis**
2 nos 90 x 35 MGP 12 seasoned pine	100 x 38 F8 HW, or 90 x 45 MGP 12

The sizes specified in Table 2 and 3 are nominal sizes. It should be noted that some species are sized and sold as dressed timber.

The methods for connecting timber posts to the support structure should have a strength not less than that provided by 2 number 12 mm diameter bolts at 150 centres. The person erecting the guardrail should make sure that the connection of the posts to the supports is adequate for the purpose.

Where it is intended to use building timber as guardrailing, the timber should be visually inspected to determine the adequacy of the particular material for this purpose.

6 Where the publication of a new edition of a referenced document results in guidance that is different to that contained in an earlier edition it may not be necessary to update to the new edition. In such circumstances, a risk assessment should be carried out to determine whether the current control measures still meet the duty in the Regulations. Where it is practicable to implement a new or modified control measure that will lower risk below current levels, steps should be taken to implement the measure at the earliest opportunity.

APPENDIX 4
INDIVIDUAL FALL ARREST SYSTEMS

Introduction

Individual fall arrest systems can be used to arrest falls where workers are required to carry out their work near an unprotected edge. However, they may only be used as the sole means of risk control if it is not practicable to use measures higher in the hierarchy of control.

Safety harnesses and lanyards can also be used as travel restriction systems to prevent workers moving from safe to unsafe areas on roofs.

Preparation

Compliance with published technical standards.

- Safety harnesses should comply with AS/NZ 1891.1 *Industrial fall-arrest systems and devices – Safety belts and harnesses*.
- Inertia reels or other self locking devices should comply with British Standard BS 5062 *Self locking safety anchorages for industrial use* or AS/NZ 1891.3 *Industrial fall-arrest systems and devices – Fall arrest devices*.
- Harnesses and other equipment should be maintained in accordance with AS/NZS 1891.4 *Industrial fall arrest systems and devices – Selection, use and maintenance*.
- Static lines and anchorages should be designed for strength and movement restraint as described in this section and comply with AS/NZS 1891.2 *Industrial fall-arrest systems and devices – Horizontal lifeline and rail systems.* Alternatively static lines and anchorages may be installed in accordance with AS/NZS 1891.2 *Supplement 1: Prescribed configurations for horizontal lifelines*.

Provide adequate training

Employers must ensure that any employee required to use individual fall arrest systems is properly trained in its use.

Installation and use

Limit free fall distance

Fall arrest systems, incorporating a lanyard, should be installed so that the maximum distance a person would free fall before the fall arrest system takes effect is 2 metres. There should be sufficient distance between the work surface and any surface below to enable the system, including the action of any shock absorber to fully deploy. Personal energy absorbers complying with AS/NZ 1891.1 should be used in conjunction with the lanyard.

Lanyards should not be used in conjunction with inertia reels as this can result in an excessive amount of free fall prior to the fall being arrested.

Use full body arrest harnesses

Full body fall arrest harnesses should be worn. Waist-type belts should not be used as injuries can result when the wearer's fall is arrested. The harness connection point to the fall arrest line should be made at the top dorsal position. An alternative attachment position is when a line and rope-grab device is used on steeply sloping roofs and the user needs to manually operate the device by having the device in front. In these circumstances the user can make the connection onto a front connection point as recommended by the manufacturer.

Maintain minimum of slack in fall arrest line

There should be a minimum of slack in the fall arrest line between the user and the attachment. The anchorage point should be as high as the equipment permits. Never work above the anchor point, as this will increase the free fall distance in the event of a fall, resulting in higher forces on the body and greater likelihood of the arrest line snagging on obstructions

Use inertia reels correctly

When considering the use of inertia reels, bear in mind that they might not be effective in certain situations. For example, if a worker falls down the inclined surface of a steeply pitched roof, the inertia reel line may keep extending from the reel – it may not lock.

Inertia reels should not be used as working supports by locking the system and allowing it to support the user during normal work. They are not designed for continuous support.

Vertical and self-retracting anchorage lines can be used as a risk control measure in connection with work performed from boatswains' chairs and ladders. Where such lines are used, not more than one person should be attached to any one line.

Use compatible components

IFAS and safety harnesses should only be used with the individual manufacturer's components known to be compatible. The use of non-compatible components may lead to "roll-out" with some hook/karabiner configurations, resulting in injury or death to the user. The hazard cannot always be avoided by using components produced by the same manufacturer under the one brand name. If you are unsure whether components of an IFAS are compatible, contact the manufacturer for further information.

Snaphooks should be of the double action type, requiring at least two consecutive deliberate actions to open. Snaphooks should not be connected to each other as this could prevent the safe operation of the snaphook (for example, roll-out may occur). Some double action hooks are susceptible to roll-out. Screw gate karabiners or hex nut connectors may sometimes be appropriate. Further guidance is provided in AS/NZS 1891.4 *Industrial fall-arrest systems and devices – Selection, use and maintenance*.

Ensure prompt rescue in event of fall

It is important that the rescue of a worker who is suspended in a full body harness should occur promptly. Suspension trauma is a condition whereby a person suspended in a harness in a substantially upright position may experience blood pooling in the legs. Depending on the susceptibility of the individual, this may lead to loss of consciousness, renal failure and eventually death.

To enable the worker to be removed from the suspended position as quickly as possible, employers should consider having a pre-rigged retrieval system in place and ensure that workers using safety harnesses do not work alone.

Damage to lines and lanyards

Preventing failure of the fall arrest line

Individual fall arrest systems can be used to arrest falls where workers are required to carry out their work near an unprotected edge. However, when fall arrest anchorages are located lower than head height or the system user is situated at a horizontal distance away from the anchorage, the fall arrest line is likely to make abrupt contact with an edge if the worker falls through or from the perimeter of the structure, as shown below. This could lead to failure of the fall arrest line.

This also applies to lanyard systems. Precautions should be taken to ensure that the lanyard will not be damaged or fail if it comes into contact with any edge during a fall.

Damage or failure occurs because contact with an edge (such as a steel I-beam or brick parapet) reduces the breaking strength of the inertia reel line. In addition, the shock loading is transferred to the snagging point of the line and not to the internal energy absorber of the inertia reel.

In the event of a fall, the inertia reel line should not contact an obstruction or edge, unless the manufacturer can verify that such contact will not impair the safe use of the inertia reel. It is important that the verification applies to the specific type of edge involved in the work process. One method of verification is by performing drop tests, based on methods of use, over a variety of edge types, such as purlins, "I-beams", roof sheets, guttering, brickwork and sacrificial metal formwork.

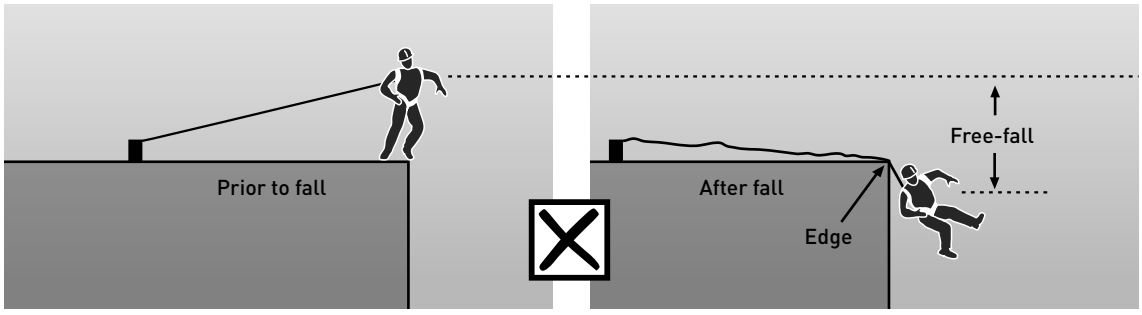


Figure 26 Incorrect set up of the fall arrest line

Positioning the inertia reel anchor points

Inertia reels should be anchored above head height to prevent the line making contact with an obstruction and to limit the free fall distance to that recommended by the designer/manufacturer. The user should work within an arc below the inertia reel, as illustrated below. Note: provision of an anchorage point above head height is difficult to achieve in demolition operations. Other control measures will therefore need to be provided.

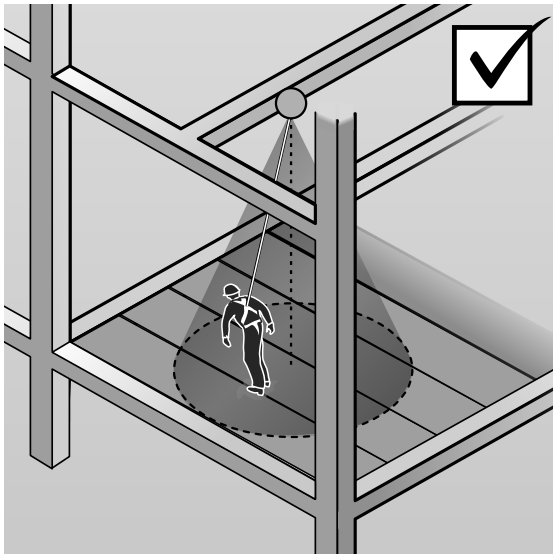


Figure 27 Working within an arc below the inertia reel

Pendulum effect

This is a potential hazard with the use of IFAS. It can occur in two situations:

- swing down
- swing back.

Swing down

The fall arrest line extends out diagonally from the anchor point, following the perimeter edge of the roof. In the event of a fall, the arrest line will slide back along the perimeter until it makes a right angle with the roof's edge. As it does so, the worker drops dangerously close to the ground. If the length of the unsupported line equals the height of the building, then the worker will hit the ground. In some situations, the arrest line may break as a result of contact with the edge of the structure, and the worker may free fall to the ground.

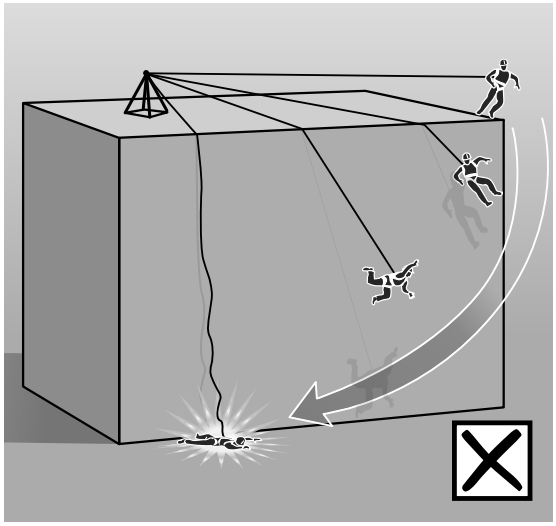


Figure 28 Swing down

To prevent the pendulum effect from occurring:

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

Swing back

In an arrested 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 Figure 29). In these circumstances, it would not be appropriate to use an IFAS.

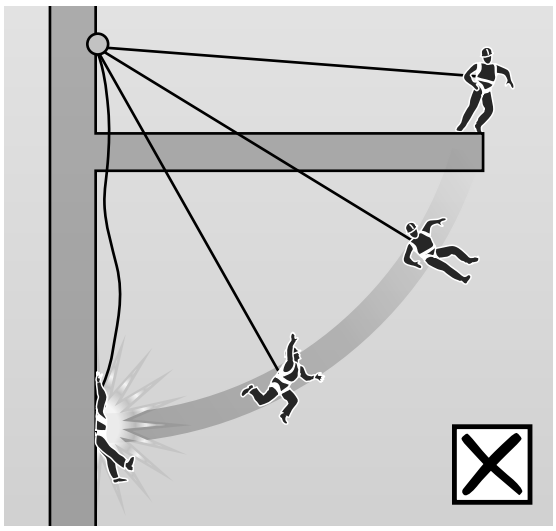


Figure 29 Swing back

Note that swing down and swing back may also occur within the interior of a roof.

APPENDIX 5
INSTALLING SAFETY MESH

Figure 30 shows one satisfactory method for installing safety mesh. The mesh is first cut to length from the roll and run out over the roof using a continuous rope system.

Mesh should be fixed to the purlins by passing each longitudinal wire through a hole drilled in the top of the purlin and tied off with at least four full turns around the wire, as shown below. Where mesh is to be fixed to timber purlins, 40 mm x 3.5 staples should be used.

The runs of mesh should be side lapped by 150 mm (one opening width). Where the purlin spacing exceeds 1.7 metres, intermediate fixing with 2 mm staples should be provided. Intermediate stapling of the mesh should be carried out from underneath.

Where it is necessary to make longitudinal joins, the knot and tie should be the full length of the tail wire, which should be 300 mm in length. The tail wire should be tied at least three times around the knot. The other tail wire is placed under the longitudinal wire and tied around the traverse wire. The 300 mm tail wire can be achieved by cutting the longitudinal wire close to the join. The join should be the full width of the mesh with every longitudinal wire joined. It is important to follow these guidelines **exactly** when making joins. The following diagram illustrates the tying process.

The entire area under the roof frame should be meshed out before the roof is loaded with bundles of decking.

Workers installing the mesh should be protected against falls. Perform a risk assessment (as described in this code) to identify the most appropriate risk control measures.

Testing of wire mesh

Safety mesh must be constructed from 2 mm diameter wire of not less than 450 MPa tensile strength, welded into a mesh having longitudinal wire spacings not exceeding 150 mm and cross wire spacings not exceeding 300 mm.

A National Association of Testing Authorities-accredited test certificate should be obtained showing that a sample of the mesh has successfully undergone the tests described on the next page.

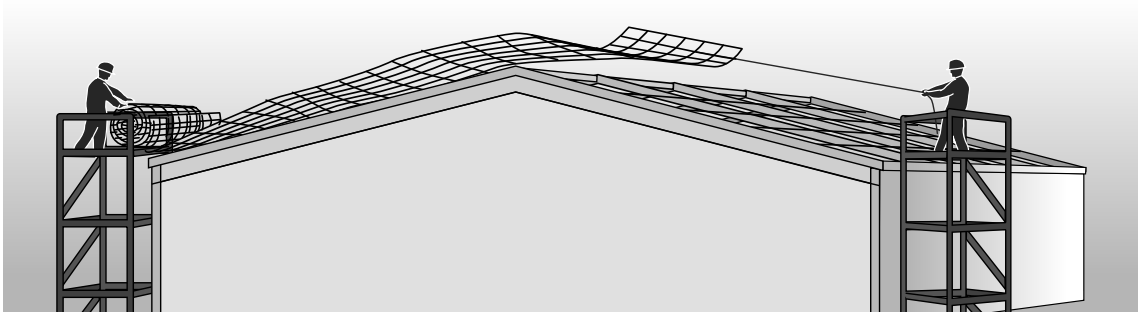


Figure 30 Mesh can be installed safely from scaffolding positioned at each end of the roof

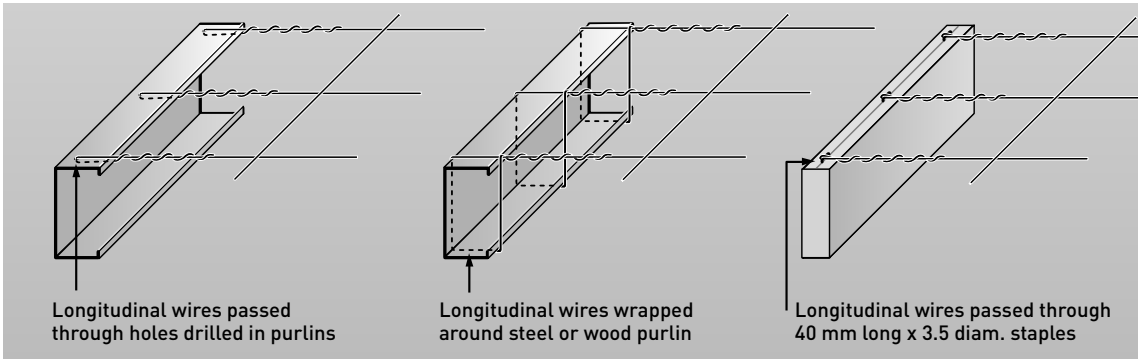
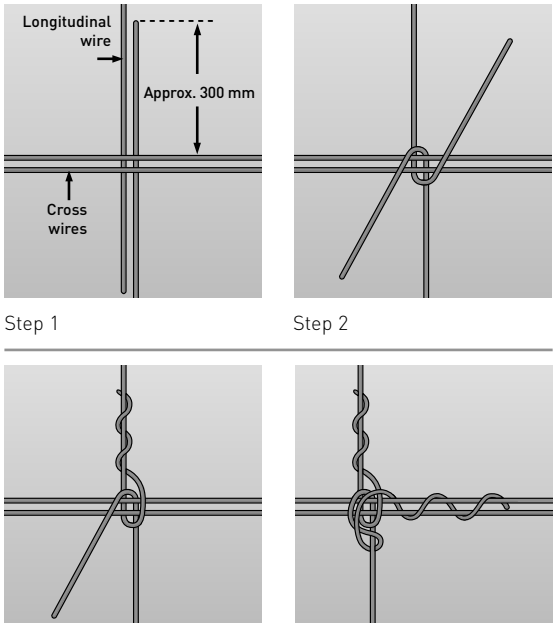


Figure 31 Preferred method of fixing mesh to the purlin

Figure 32 Longitudinal wire joining



Three types of tests should be performed:

1. ***Tensile strength***

   The tensile strength of the wire (2 mm) must be not less than 450 MPa.

2. ***Weld test of joint***

   Tensile test performed on wire with a weld (cross wire) joint at the centre of the test specimen. There should be no reduction in strength of specimen or not less than 90% of strength of plain wire.

3. ***Static load test***

   The test rig is to comprise a rectangular frame having purlin cross members spaced at 1.5 metre intervals to form three bays. The frame is to be not less than 2 metres in width. The sample to be tested should be pulled taut by hand and fixed to the end purlins by passing the ends of the longitudinal wires through holes drilled in the top face of the purlin and being twisted about itself four times.

   The test load should comprise of sand in a hessian bag, approximately 1500 mm by 350 mm in diameter, and having a mass of 165 kg.

   The mesh should be tested by dropping the test load from a height of 1400 mm into the centre bay so that it strikes a minimum of ten longitudinal wires. If dropping the test load breaks none of the wires or welds, the mesh sample is satisfactory.

APPENDIX 6
SAFE WORK PROCEDURE – ERECTION AND DISMANTLING OF MODULAR SCAFFOLDS

Scope

This procedure applies to the erection and dismantling of normal scaffolds constructed from any make or model of prefabricated modular scaffolding system except for cantilevered base lifts and hung scaffold configurations. This procedure should only be used where an advance guardrail system cannot be used for the protection of scaffolders.

Application

This procedure applies to any worksite where the company is erecting/dismantling modular scaffolds.

Procedure

1. Except during the relocation of planks to the next lift, any scaffolder working aloft must work from a fully decked platform.
2. When relocating the last plank in a run, the scaffolder lifting the plank will brace his or her back against a standard and keep the feet spread, with one foot securely on the transom and one foot securely on the ledger.
3. The access system (stairs or ladders) will be installed progressively as the scaffold is erected. Climbing the scaffold framework is forbidden.
4. After planking the lift, the next immediate task is to top up any standard on open sides and ends that break below guardrail height.
5. Where standards or ledgers need to be passed up before the guardrail is installed, the scaffolder will brace himself or herself against an unjoined standard that extends at least to guardrail height.
6. Guardrails will next be fixed to all open sides and ends from which a fall of more than 2 metres is possible. This will be completed before any other work task. These guardrails are to be left in place until dismantling of the lift.
7. Erection of the remainder of the lift can now proceed with edge protection in place.
8. Dismantling will be carried out in reverse order.

APPENDIX 7
ROOFING CHECKLIST FOR BUILDERS AND BUILDING TRADES CONTRACTORS

1. Is there safe access to roof areas?

Where there is no permanent access to roof areas, provide properly constructed temporary access. Portable industrial-grade ladders, i.e. with a load rating of at least 120 kg, secured against movement, pitched at about 75 degrees (4 to 1) and extending at least 900 mm above the stepping-off point may be suitable for minor works. For major roofing work, provide a scaffold access tower, preferably one with temporary stairways. Where more than two workers are likely to access the roof at the same time, provide an access tower that is at least medium duty. Provide a heavy-duty access tower where more than five workers are likely to be on the roof. Never allow workers to use elevating work platforms or barrow hoists to gain access to the roof.

2. Have existing roofs been thoroughly checked?

Before commencing work on an existing roof, make sure it has been thoroughly inspected to determine its strength. Check the condition of roof trusses, rafters, purlins and roof battens. Identify all areas of fragile roofing such as cement sheeting and fibreglass skylights. Check the fixing and strength of safety mesh, paying particular attention to any signs of heavy corrosion. Strengthen any suspect areas of roof support with temporary props or similar.

3. Are workers protected from falling off roof edges?

A fall from height is the single most serious risk associated with roof work. Wherever there is any danger of a worker being killed or seriously injured by falling over the roof edge, provide an appropriate means of protection. Where a scaffold has been provided for construction of the walls or guttering, leave it in place until the roof work is complete. Where this is not possible, use a temporary guardrailing system. There are proprietary guardrailing systems available which are suitable for a wide range of roofing situations. For the rare occasions when guardrailing is not practicable, consider using other measures such as safety line systems, including travel restraint systems and fall arrest systems. Make sure that any safety line system is securely anchored and is set up so that inertia reel lines cannot be severed on sharp edges. Also make sure that the lines can be used without creating the "pendulum effect" in the event of a worker falling.

4. Are workers protected from falling from incomplete roofs?

For metal deck roofing, the best way to protect roof workers from falling over leading edges is to cover the entire roof area with safety mesh before the roof is laid. This also provides ongoing protection for future roof maintenance and repair work. For roof tiling work, the close spacing of roof battens is usually adequate to safeguard workers from leading edge falls.

5. Are workers protected from falling through skylights and penetrations?

Skylights that are not protected with safety mesh and penetrations left for the installation of air-conditioning etc, can be a danger to roof workers. Securely cover them or fix temporary guardrailing around them.

6. Are people protected from the dangers of falling material?

Isolate the area below roof work wherever there is any danger of people being struck by falling material, debris or tools. Also isolate areas under roof edges unless toeboards are fixed to temporary guardrailing to contain all material, debris and loose tools.

7. Do roof workers have appropriate footwear?

Roof workers need protective footwear that gives them a non-slip and flexible grip on the roof surface.

NOTES

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