Department of Labour
TE TARI MAHI

Guide to Health and Safety in the Timber Processing Industry

ACC thinksafe

A helpful guide to making workplaces safer

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Introduction

Timber processing can be a hazardous business. From the use of machinery, working at heights and handling heavy materials to exposure to dust, noise and chemicals, potentially harmful events can happen at any time. These events can affect a person's health, for example causing them to suffer skin and respiratory diseases. They can cause injury such as a loss of fingers or even death. It's not just staff who may be affected – visitors, contractors, cleaners or anyone on your site can be at risk of injury or illness.

For you, workplace accidents can mean:

- downtime on the factory floor
- costly repairs to damaged machinery and equipment
- paying overtime or finding replacement workers to make up for lost time.

For your staff, workplace injury and illness can cause them pain and suffering. They may no longer be able to live their lives to the fullest, and they and their families may have to get by on less income.

Having good work practices can help you and your workers to avoid these costs.

Keeping your workplace safe is good for everyone and, by law, you must take all practicable steps to make sure it is. But safety is not just an employer's problem. Your staff must be adequately trained so that they can follow correct work procedures and use the safeguards that you provide.

The information in these guidelines will help you to identify hazards in your workplace and give you ideas on how to keep your staff and visitors safe at all times. Specifically, these guidelines help you to:

- identify places where injury or harm could occur
- work out how likely it is that injury or harm will happen
- put in place measures to protect your workers and your workplace.

Following these guidelines will give your staff confidence to carry out their work quickly and efficiently and save you the costs of an unsafe workplace.

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Key terms explained

Term	Explanation
'All practicable steps'	doing all you reasonably can, taking into account: • how severe any injury or harm is likely to be • how likely that injury or harm is to happen • how much you know about the hazard and how to remove or reduce or control it • how available, effective and costly the possible safeguards are.
Danger zone	the zone within or around machinery where there is a potential health and safety risk.
Guard	a physical barrier that prevents or limits people's access to a danger zone.
Hazard	anything (an activity, arrangement, circumstance, event, occurrence, phenomenon, process, situation or substance) that is an actual or possible cause or source of harm. Hazards may occur inside or outside your workplace. They include situations where a person's behaviour may cause harm to themselves or others. A person's behaviour may be affected by physical or mental fatigue (tiredness), drugs, alcohol, traumatic shock or some other condition.
Interlock	a safety device that connects a guard or machine part with a machine's control or energy system.
Isolation	a device that disconnects machines and equipment from all energy sources so that they cannot be operated.
Lockout	where the controls of machinery or equipment have been locked or have been isolated from the energy source, to stop them being operated.
Machinery	an engine, motor or other appliance that provides mechanical energy using sources such as compressed air, fuel combustion, electricity, gas, gaseous products, steam, water and wind. Machinery includes: • any plant affected by the motion created by the machinery • a lifting machine, a lifting vehicle, a tractor and a machine that uses, in some way, human effort to create motion.
Reasonable reach	the distance 'most people' can safely reach under, over, around or into any hazardous area.

Risk	how severe an injury or damage is likely to be, how likely it will happen and how frequent the exposure is to the hazard.
Safe by position	where the danger zone can't be accessed – it is either out of reasonable reach or in a position that is not a hazard.
Significant hazard	a hazard that has caused, or could cause, serious harm.

Section One

Safe Access

1.1 Making workplace access safe

What is safe access?

Making access to and around your workplace safe is about keeping people away from hazards, whether they're working for you or just visiting. Safe access is concerned with all the places people need to go to do their work. It includes vehicle access, walkways, handrails, slippery surfaces, confined spaces and work carried out at heights.

What the law says

The law requires employers to keep a safe workplace. Following the good safe access guidelines set out in this section will help you to meet your legal requirements under:

- The Health and Safety in Employment Act 1992
  Employers are required to identify hazards in their workplace and do all they can to ensure the safety of employees and others in the workplace
- The Health and Safety in Employment Regulations 1995
  - Overcrowding
  - Containers of liquids
  - Loose but enclosed materials
  - Raised objects
  - Cleaning, maintenance or repair of machinery
  - Heights of more than 3m
  - Scaffolding
  - Excavations
- Codes of Practice
  - Code of Practice for Timber Stacking, Packeting and Transportation
  - Guidelines for the Prevention of Falls

1.2 Identifying hazards

Identifying hazards in your workplace is the first step in making sure your staff are working in a safe environment. You need to work through a process to identify all the access hazards in your workplace and decide how likely it is that any harm or injury will happen.

A process to deal with hazards

Looking for risks

To identify hazards, walk through all your business's work areas, including access ways, and look for the areas where injury or harm could happen. Divide your workplace into manageable areas and identify the hazards for each area.

Ask your staff to do the same but have them read these guidelines to get an idea of what to look for.

Common hazards to check for

Access hazards are likely to fall into these categories:

Potential hazard	Likely to happen...
Steps/stairs	• slips, trips or falls
Conveyors	• slips, trips or falls
Log storage	• falling logs from unstable stacks
Access ways	• slips, trips or falls
Portable ladders	• falls
Walkways	• slips on slippery surfaces
Service platforms	• slips and falls
Raised walkways	• falls
Tarping wood stacks	• slips and falls
Timber stacking	• collapse of unstable stacks
Moving vehicles	• crushing, being run over

1.3 Assessing access hazards

In assessing possible risks you're working out how likely it is that hazardous events will happen. This allows you to put your efforts into dealing with those hazards and factors that are most likely to cause injury or harm.

See the ACC website (www.acc.co.nz) for ideas on identifying and assessing hazards. Look under 'Injury prevention', then 'Safe at work'. See also the OSH website – www.dol.govt.nz. Look under 'Safety and health at work'.

1.4 Good practice for safe access

Where you identify hazards and decide that there is a strong possibility of their causing illness or harm, you need to work through a process to control them.

Priorities for good practice

What do you need to do to eliminate, isolate or minimise the hazard?

What safeguards can you apply?

What work practices and processes need to change?

The best thing you can do to improve workplace safety is to eliminate hazards. If that's not possible, you should think about how you can isolate them, which may include using safeguards. If that's not possible, you need to think about how you can change work practices and processes to minimise injury, harm or illness.

You need to list all the hazards you identify in your workplace in a hazard register. In the register you also need to note the hazard controls you decide on.

See sections 7 to 10 of the Health and Safety in Employment Act 1992.

Access to your site

If you have hazards in your workplace, you need some way of controlling who can enter your site. People should not be able to just walk in or around your site, and vehicles and pedestrians need to be kept separate as much as possible. The amount of security you need will depend on what the hazards are and how likely they are to cause injury or harm.

How to minimise the risks

Getting onto your site

You need to restrict access to your site. Use signs to direct visitors to your office where they can sign a visitor's book and, where you can explain any danger zones and provide them with personal protective equipment. Such gear may include Hi Viz clothing, hard hats, safety glasses and suitable protective footwear.

Once on your site

Make sure visitors comply with site safety rules and/or are guided at all times by staff who know what the hazards and emergency procedures are. You need to limit who can get to areas where machines are operating. You also need to have workplace rules and procedures in place so that operators are aware of other people in the area.

Restrict access where machines are working

Falling logs are a possible hazard. Logs need to be supported or stacked at a slope of less than 45°

Common areas

Think about providing safe walkways to commonly used areas – such as toilets, mealrooms and offices. This can be as simple as painting lines on floors and roads. Make sure you show vehicle routes and walkways on your workplace site plan.

How to minimise the risks

Keep the path of walkways away from your site's hazard risk areas. Not only will they keep staff and visitors safe, your operations will run without interruption.

Conveyors

The moving parts of conveyors can cause accidents. You need to provide walkways that avoid the hazard areas. See also Section Four of this guide, page 4:12, on guarding of conveyors.

HAZARD!

✘ A hazard is created by conveyor rollers transferring timber across this walkway

How to minimise the risks

Improving practices

Stop your staff walking between conveyors, moving wood or timber. You should plan pathways to go around or over the conveyor area. Or use an interlocked gate.

Staff run the risk of slips, trips and falls if they walk on conveyors. You need to stop workers doing this unless the conveyor has been locked out (see Section Three of these guidelines on lockout).

Improving protection

Provide safe walkways wherever staff need to go regularly to carry out their tasks. If you have walkways over machinery they must have handrails. See the section on handrails, page 1:14.

✘ Without handrails your staff could fall

✔ Providing handrails lessens the risk of falling

Use expanded mesh (or something similar) under chain conveyors to allow safe access. Otherwise you should provide walkways over the conveyors.

Surfaces

Polished, smooth or wet floor surfaces increase the risk of staff slipping.

How to minimise the risks

Non-slip surfacing

Make sure flooring surfaces around your workplace are non-slip. They need to be:

- tread plate
- expanded mesh, or
- some other non-slip product.

If you use wooden walkways you need to apply a non-slip surface, especially if they're likely to get wet.

See the standards for non-slip surfaces (*AS/NZS 3661.1 : 1993 : Requirements and AS/NZS 3661.2 : 1994 : Guide to reduction of slip hazards*) for more detailed information.

Work at heights

You should carry out a risk assessment for all work at heights. In deciding on prevention measures you should first consider using permanent platforms, handrails and stairs. Other fall protection measures must be taken where your employees are at risk of a fall of 3m or more. See *Guidelines for the Prevention of Falls* available from OSH.

How to minimise the risks

Fall protection measures can include:

- permanent platforms, handrails and stairs
- scaffolding or edge protection
- cherry picker, scissor lift or approved forklift cage
- approved fall restraint or fall arrest systems (including a rescue plan).

You need to have procedures for working safely at heights

Ladders

There is a range of safety measures you need to think about when using ladders.

How to minimise the risks

Portable ladders

Being the most widely used ladder in the industry, it's likely that your workplace uses stepladders. Stepladders must be robust and must meet the requirements of the standard *AS/NZS 1892.1 : 1996 : Portable ladders – metal*.

Stepladders should only be used:

- for places staff need to go to only every so often
- where both hands are free
- where staff need to be no higher than **two steps** down from the top.

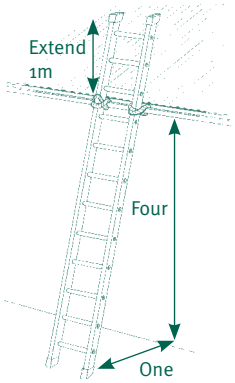
Mind your step

Staff should always face the stepladder tread when going up and down a ladder.

✘ A portable extension ladder is not a safe option in some situations

✔ A portable platform is a much safer option

Extension ladders must be secured at all times – being held by another worker until the ladder is tied and extended past the work area. Staff should go **no higher than four rungs** from the top and the slope of the ladder should be no greater than one horizontal unit to four vertical units (see figure below). Never use the ladder horizontally as a work platform.



Note: You must put in place a system to prevent falls where work is undertaken within 2m of a roof edge.

Maintaining portable ladders

Regularly check that your portable ladders meet the requirements of standard *AS/NZS 1892.5 : 2000 : Portable ladders – selection, safe use and care*. You should look for:

- bent stiles (the ladder frame) and steps
- stays not in position
- rubber feet missing or worn
- stress fractures at rivet points
- loose rivets – the telltale sign is a dark circle around the rivet head
- staff exceeding the safe working load for the ladder.

Make sure you keep a record of your checks and maintenance.

Fixed tread or stepladders

These ladders should:

- have treads of at least 100mm in depth
- have treads no further apart than 200–250mm
- be pitched at an angle of 60–70 degrees
- have handrails fitted at least 900mm above the front edge of the tread.

Fixed rung ladders

These ladders should:

- have rungs of 400mm in width
- have the rungs no further apart than 250–300mm
- be pitched at an angle of 70–90 degrees.

Fixed rung ladders should be no higher than 9m (without a platform). Ladders over 6m tall require cage guards or hoops. These safety features must be fitted at 2.5m from the ground. The top part of the ladder frame must be 1m above the point the worker is going to step off.

If you can't fit cage guards or hoops you need to use a fall arrest system, eg, harnesses.

Fencing

Fencing is a good safety measure to limit people coming into contact with major hazard areas.

✘ Handrails are useful for identifying access ways and preventing falls but must not be used to prevent access to uncontrolled hazards

✔ Fencing is useful in preventing access to areas with multiple hazards

How to minimise the risks

To meet requirements fencing should:

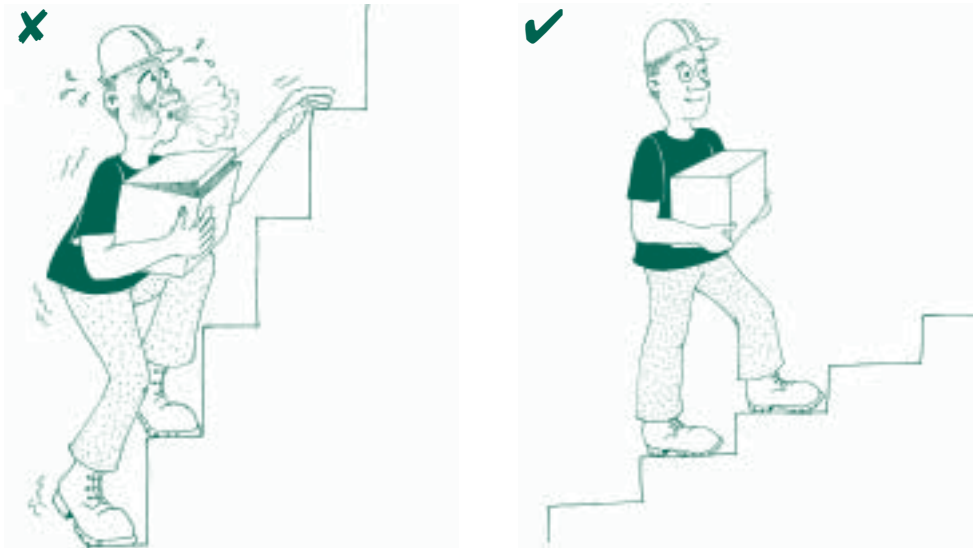
- be 1.8m high
- have a gap of no more than 200mm from the ground
- have interlocked gates that stop machinery before staff enter the area or other approved methods of preventing access.

See *AS 4024.1 : 1996 : Safeguarding of machinery – general principles*.

Think again
On their own, handrails are **not** acceptable fences for preventing people coming into contact with a significant hazard.

Stairs

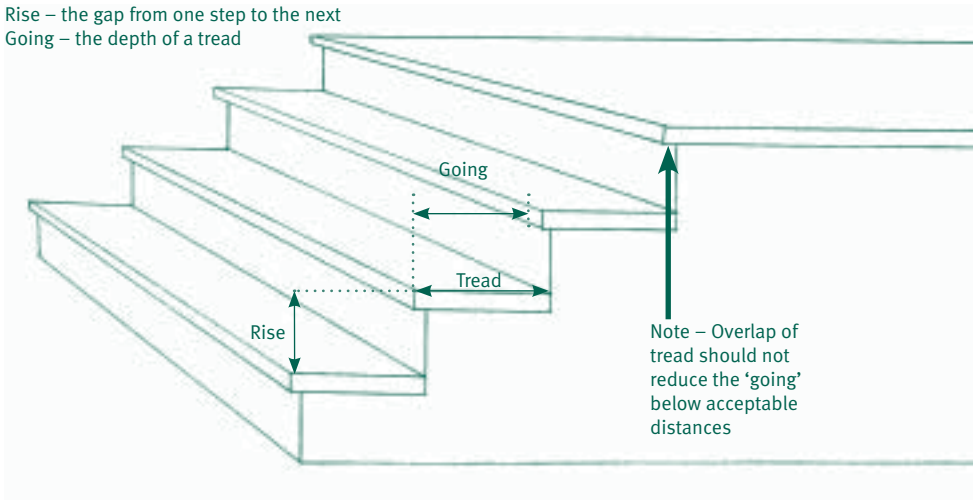
If your staff are working in an area that is off the ground, you need to provide stairs as a main means of access.



How to minimise the risks

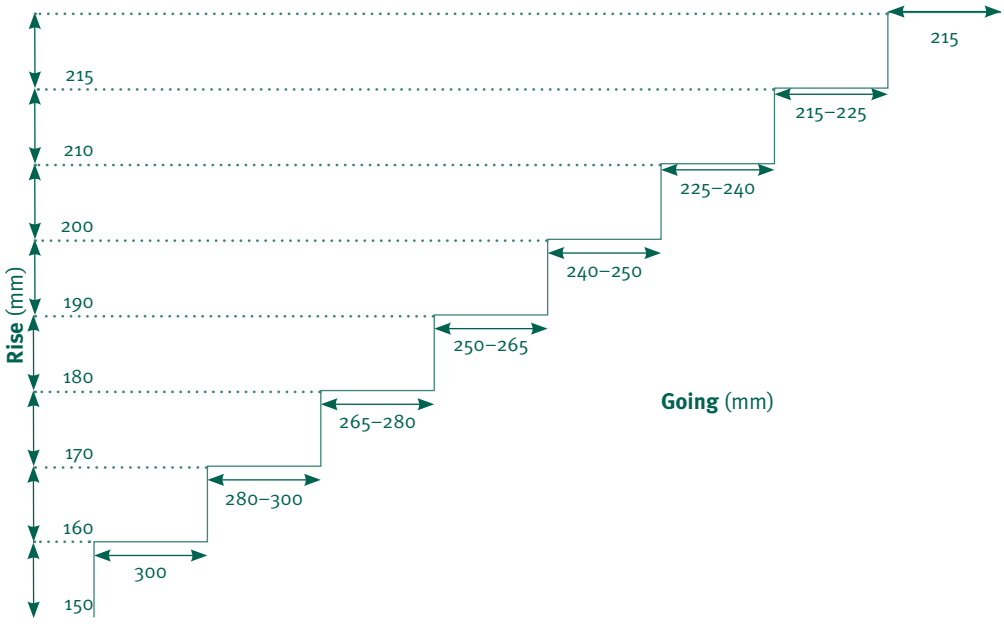
To meet requirements, stairs must:

- have goings that are between 215 and 305mm in depth, with each going the same depth
- have rises that are between 150 and 215mm, with each rise the same height
- be built to an angle of between 26.5 and 45 degrees
- have a handrail on the open side of the stair – you need two handrails if the stairs are over a metre wide or open on both sides.



See the standard *NZS/AS 1657 : 1992 : Fixed platforms, walkways, stairways and ladders – design, construction and installation* for more information on requirements for stairs.

This figure shows the range of acceptable features for stairs, eg, a stairway with a rise of 170mm must have a going of 265–280mm. See *NZS/AS 1657* for more detail.



Handrails

You can use handrails to identify safe walkways around your workplace. However, you cannot use handrails as the only means to prevent people coming into contact with a hazard.

How to minimise the risks

To meet key requirements, handrails should:

- be 900–1100mm high
- have a mid rail
- have a 150mm kickboard if there is any risk of items falling off walkways and injuring someone.

✘ Posts and chains

✔ Handrails must be solidly built with mid rail and, where needed, kickboard

A firm foundation

Posts with chains are not acceptable. Handrails and mid rails (and where needed, kickboards) should be built out of solid materials.

If you need to provide access for forklifts or loaders in areas such as loading bays, you should use either:

- hinged fences that open inwards, or
- removable or sliding rails.

See the OSH *Guidelines for the Prevention of Falls* and the *New Zealand Building Code* for more information on handrails.

Forklift cages

If you need staff to work at heights, using forklift cages as a work platform can stop them falling.

How to minimise the risks

When used as a platform the forklift cage must meet the requirements of standards:

- *NZS/ANSI/AMSE B56.1 : 2000 : Safety standard for low lift and high lift trucks*
- *AS 2359.1 : 1995 : Powered industrial trucks – general requirements*

To meet key requirements, the forklift cage must:

- be able to carry a load of 250kg
- be **locked** on to the forks to stop it slipping off
- be solidly built
- be less than 1200 x 1200mm with a 100mm kickboard
- have a 2m high mesh screen between the worker and mast – with a 100mm gap between the mesh and mast
- have mesh that meets the requirements of *AS 4024*
- have 900–1100mm high front and sides and a handrail inside the cage
- have an access gate that swings inward, springs shut and has a suitable catch.

This engineer-certified forklift cage features an extended rail to which workers can attach harnesses while spreading tarps on timber stacks

Beware

Forklift drivers need to stay on the vehicle while staff are attached to the cage and have a system for communicating with those staff.

Tarping of timber trucks

As timber or chip trucks are over 3m high, staff are likely to be seriously injured if they fall while covering them with tarps. You need to take all possible steps to prevent falls.

As well as general slips and trips, the sorts of things likely to cause a fall include:

- uneven surfaces
- wind
- slippery surfaces created by tarps or plastic-wrapped timber.

HAZARD!

✘ Tarping timber in windy conditions can cause a hazard

How to minimise the risks

Think about using curtain siders instead.

✔ Curtain siders

Or automatic tarping systems, which do not require operators to get on the load.

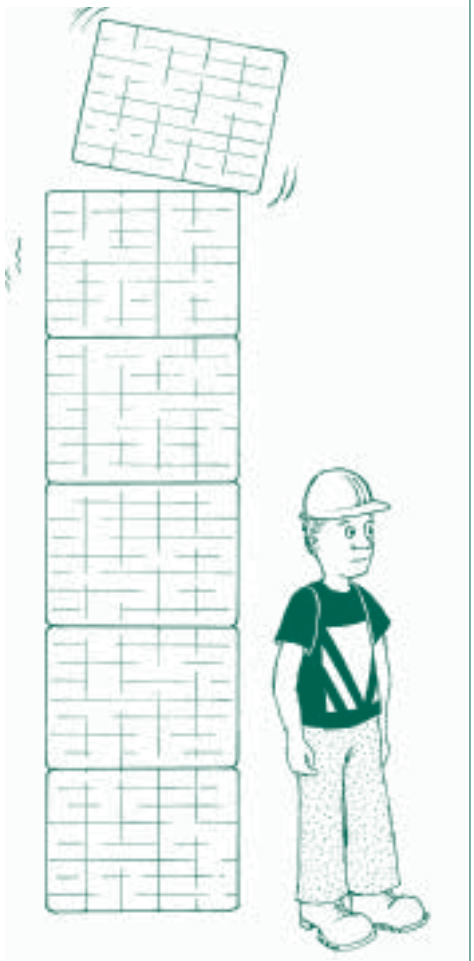
These safety measures **eliminate** the risk of falls.

To **lessen** the risk of falls, think about using fixed or portable tarping frames. These frames need to be designed by engineers.

Staff have to wear full harnesses to work on these frames. While these frames improve safety you must also make sure your staff are fully trained and supervised in fall prevention. Such training needs to include a detailed emergency plan of action if someone falls.

Timber stacking

Unstable stacks of timber are possible hazards. Staff can be injured while working on top of unstable stacks that collapse, as can anyone working nearby.



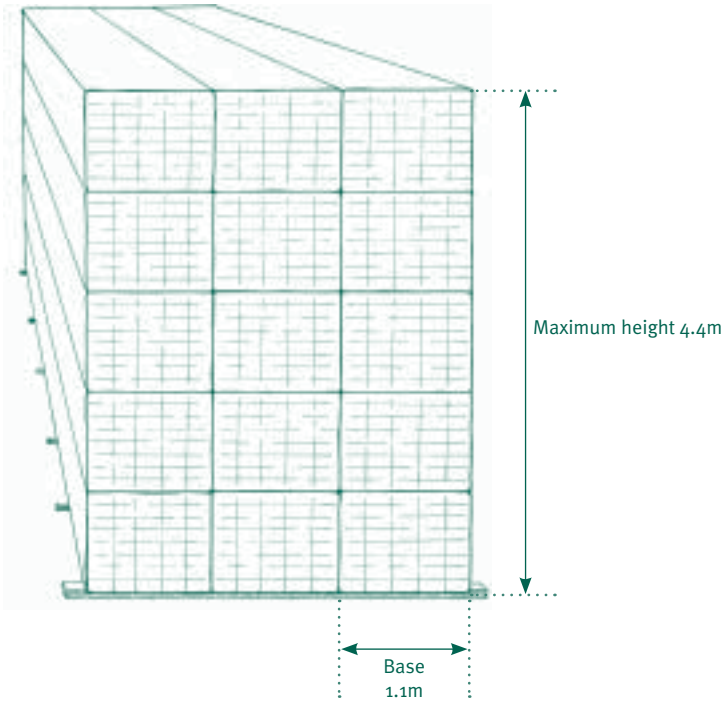
HAZARD!

✘ A hazard is created by timber stacked at heights of more than four times the base

✘ Using tiers to stack timber at more than four times the base does not avoid the hazard. Staff are still at risk when stacking and unstacking

How to minimise the risks

Make sure timber stacks are stable on level ground with solid bearers. The height of a stack must not be more than four times its base. This applies to all timber stacks, eg, it includes stacks in the open and in dry sheds. It also applies to plastic-wrapped timber packs.



When placing fillets in packs, make sure you comply with the *Code of Practice for Timber Stacking, Packeting and Transportation* as this also helps the stack stability.

✔ Safely stacked timber

You may be able to increase the stack height if you strap smaller packs together. Such strapping doubles the base measure, which increases the height you can stack.

See the *Code of Practice for Timber Stacking, Packeting and Transportation*.

Isolation and lockout

Staff can be killed or seriously injured if machinery or equipment is not properly locked out before working on it, for example when fixing, cleaning or maintaining it.

Isolation or lockout devices are safety devices that are connected to a machine's control or power source. They prevent machines being started. Such devices improve the safety of your workplace.

How to minimise the risks

Make sure machinery such as conveyors are fitted with isolation measures that prevent the machine being started while someone is working on it.

Keep talking

Good communication between workers (so that everyone in a work area knows where each person is) is vital. **Everyone** working on or around the machine must have personally locked out the machine.

Example

Good health and safety systems, including good communication, are needed to ensure a loader driver doesn't load logs onto a stopped conveyor while it's being checked by another worker

If you have areas in your workplace where there are a number of potential hazards, think about using fencing with interlocked gates to restrict the number of people entering.

✔ Interlocked gates with warning sign

See Section Three of these guidelines on lockout for more information on isolation and interlocking measures.

Confined spaces

Don't overlook confined spaces in your workplace. Lack of oxygen, in particular, can be a hazard in these areas.

How to minimise the risks

First, identify all the confined spaces in your workplace. Then put in place controls to limit who can enter these spaces to only those staff holding a confined space entry permit.

The standard *AS/NZS 2865: 2001 : Safe working in a confined space* and OSH guidelines have detailed information on working in confined spaces.

Limit who can enter confined spaces

To meet the key requirements, work in confined spaces should:

- be identified as such
- be controlled by a confined space entry system
- have ventilation and atmosphere monitored
- have protective equipment (including breathing equipment) available
- be carried out by fully trained employees
- have a rescue system in place.

Generally, if you need staff to carry out work in a confined space you should have another trained worker watching or supervising the work.

Something in the air

Be aware of other hazards, such as welding, in confined spaces. You need to pay special attention to areas such as copper, chrome and arsenic plants where the welding of contaminated machinery can produce toxic fumes.

Signage

Don't rely on signs alone to deal with hazards in your workplace. Signage can only be used as a means of minimising a hazard.

But if you're unable to lessen a hazard risk in any other way, the very least you need to do is put up warning signs.

How to minimise the risks

You can use signs that are symbolic (that use simple pictures) or that use words, or a mixture of both.

Signs should be:

- appropriate
- easy to see
- short, clear and easy to understand.

Appropriate signs

Your signs need to follow the correct colour code contained in the standard *NZS/AS 1319 : 1994 : Safety signs for the occupational environment*.

Colour	Use
Red	• Stop or prohibition, eg, 'No Entry' • Danger (likely to be life threatening) • To identify fire fighting equipment
Yellow	• Caution or warning, eg, 'Fork lifts in use'
Green	• General safety, eg, 'First Aid', 'Fire Exit
Blue – light	• General information, eg, 'Toilets'
Blue – dark (when used with a circle)	• Mandatory (required) action, eg, 'Wear safety helmet'
Orange	• Hazardous chemicals

Other colours are used to identify different pipelines and gas cylinders:

- violet – acids
- grey – steam
- black – drains
- beige – natural gas.

Luminous signs (glow in the dark), usually green or red, are used to mark exits.

Easy to see

Signs must be easy to see. If you're using symbols on signs, the size of the symbol has to increase by 15mm for every metre of distance that a sign will be viewed. For example, if the sign will be viewed from 1m away the symbol must be at least 15mm. If it's 2m, the symbol must be at least 30mm.

If you're using lettering, the letters must be at least:

- 5mm for upper case (capitals)
- 4mm for lower case.

Make sure signs are well lit and are in a place where most staff can see them. If you need to use a sign in an area that's not well lit, increase the size of the sign, or the size of the lettering, by 50 percent.

Short, clear and easy to understand

- Use as few words as possible.
- Use standard, widely recognised symbols.
- Use specific, not general, messages, eg, 'Obey Health and Safety Act' is too general while 'Wear safety glasses' is good.

Extra marks

You'll improve the safety of your workplace if you mark hazardous areas and walkways with either painted or taped yellow strips at least 50mm wide.

If you've got staff working at night, highlight features such as stairs, doorways and power points with luminous strips. This will help staff find their way if you have blackout.

Lighting

Lighting levels in your workplace need to meet the standards set out in *AS/NZS 1680.2.4 : 1997 : Interior lighting industrial tasks and processes*.

The only exception to these standards is lighting around the head rig and other operations involved with the use of lasers in lining up timber.

Annual check-up

Conduct a lighting survey once a year to make sure you're providing enough lighting at the right levels.

Emergency lighting and exits

Emergency lighting in your workplace needs to meet the standards set out in the *New Zealand Building Code* (F6).

In case your energy source fails, you need to have enough back-up lighting to light up the areas staff need to find the emergency exits. You can use luminous strips on doors and stairways.

Prepared to power down?
Think about how your machines will run down if you have an energy failure and how they will restart when energy is restored. Check Section Four of this guide on machine guarding.

Personal protective equipment

You need to provide protective gear to your staff. The gear they need will depend on the tasks they're carrying out.

Personal protective equipment includes:

- safety footwear
- hearing protection
- overalls
- safety glasses
- Hi Viz clothing
- dust masks
- chemical safety clothing and equipment
- chaps for chainsaw work
- safety helmets
- gloves.

Note: If you use personal protective equipment, it is likely you will be required to monitor the health of your employees. For example, monitoring the hearing of employees working in noisy environments, and monitoring the lung function of employees working in dusty environments.

Section Two

Manual Handling

2.1 Making manual handling safe

What is manual handling?

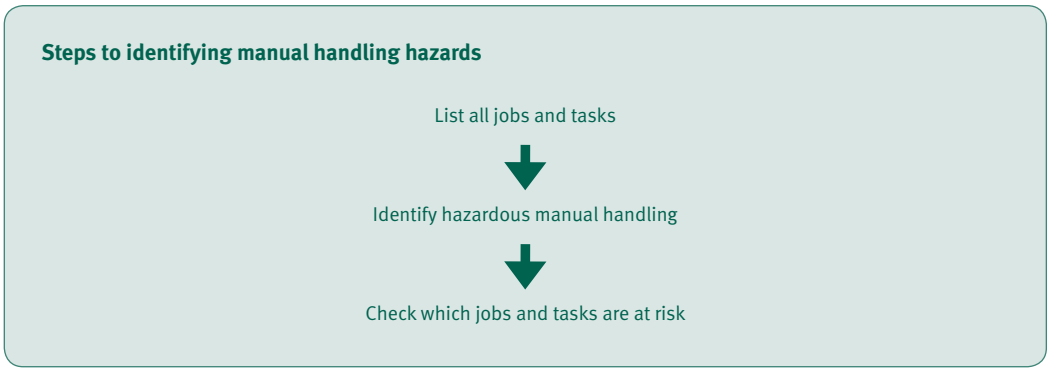
Manual handling is any activity that requires a person in some way to lift, lower, push, pull, carry, throw, restrain or hold an object. Manual handling is a necessary part of timber processing, even with the amount of machinery used in the industry. In a sawmill this could include lifting, turning or pulling timber, changing machine knives, freeing blockages and cleaning. Tasks such as filleting require almost constant manual handling while other tasks, such as maintenance, require only occasional manual handling.

For much of the time these tasks are carried out without a problem. It's only when a task becomes more than a person can handle that accidents (and injury) can happen. They may be caused by a sudden effort (pushing a heavy load, or by an action carried out over time) such as an action that is repeated in an awkward working position.

In almost all cases, there'll be a number of factors that cause a manual handling injury. To provide a safer workplace you need to identify and address all the main risk factors for manual handling accidents.

2.2 Identifying hazards

Identifying hazards in your workplace is the first step in making sure your staff are working in a safe environment. You need to work through steps to identify all the jobs that use manual handling and decide how likely it is that any harm or injury will happen.



The information in this section on identifying is based on the *Code of Practice for Manual Handling*. See the Code for more detail.

List the jobs and tasks

A particular job or activity may involve a number of manual handling tasks. You need to list:

- all the jobs in your workplace that involve manual handling, eg, sawdoctor, grader, tablehand
- then, all the manual handling tasks included in these jobs, eg, removing bandsaw blades, folding bandsaw blades for transporting.

Identifying hazardous manual handling

Check back on your company records to see if manual handling accidents have happened in the past. Records that will be helpful include hazard registers, accident registers, investigation reports and health and safety audits.

Talk to your staff. They may give you more ideas on the manual handling tasks they carry out in their jobs and what tasks they think are hazardous.

Watch your staff as they carry out manual handling tasks to see if there are any specific hazards. Watching, checking and actually doing the tasks yourself (where safe) are good ways to gather information.

Checklist for hazardous jobs and tasks

You then need to find out whether any of the manual handling hazards you identified in step two are happening in the jobs you identified in step one. You may find this checklist helpful...

Are workers...	Yes	No
Twisted, stooped, or in awkward positions, eg, frequently reaching or working to one side or having to work in an awkward position?		
Working in fixed or rigid positions for a long time, eg, inspecting conveyors where little change of movement is needed?		
Working in positions that don't change or where the same movements are used over and over, eg, flipping boards for grading?		
Using sudden, uncontrolled or jerky movements, eg, lining up boards in packets, boards breaking during transfer?		
Handling or reaching away from the body, eg, stacking into packets below knuckle or above elbow height?		
Using a lot of, or constant, force, eg, pulling heavy loads, pushing packets?		
Handling heavy or awkward loads, eg, changing saw blades?		
Exposed to whole body or upper limb vibration, eg, working in a control cabin that is vibrated by surrounding machinery?		
Working for long periods without breaks?		

Recording your findings

Keep a record of your findings in a Manual Handling Hazard Control Record (see the *Code of Practice for Manual Handling*). If you answer 'yes' to any of these checklist factors, you need to further assess the possible hazard (the Code can help you do this). If you answer 'no' to any of these factors you don't need to do anything more than keep a check on the particular work process as part of your regular review of hazards.

Common hazards to check for

Handling hazards are likely to fall into these categories:

Potential hazard area	Likely to happen...
Worksurfaces	• fatigue or injury from overreaching, bending forward
Poor table design	• fatigue or injury from overreaching, bending, uncomfortable working positions
Heavy timber	• fatigue or injury from carrying or moving weight
Handling movements that repeat over and over, eg, small timber products	• fatigue through overuse, faster work pace
Tooling	• injury from sharp blades, heavy loads, handling difficulties
Panel products	• fatigue or injury from heavy loads, hard to carry or unstable loads, splinters

2.3 Assessing manual handling hazards

Once you've identified hazardous manual handling tasks in your workplace, you need to assess them to see if they're significant and to decide what actions you'll take to control them. You should focus first on those hazards that are most likely to cause illness and injury.

Things to think about

You need to think about a number of factors when you assess hazards to decide how severe they're likely to be and how likely it is that the hazards will happen. Think about:

- **load** or the muscle force (human effort) used to do the task, eg, the force required for a grader to flip boards
- **posture and workplace layout** – how much bending forward or twisting is required, how far the load is from the body, how stable the worker is when doing the task
- **work conditions and environment** – is there enough space, is the lighting good, is the floor surface good, is the area free from obstacles?
- **time** – consider how many times the task is done, or how long it takes to do the tasks during the shift, whichever is the greater.

Factors that increase the risk

There are five factors that can increase the risk of manual handling injury happening:

Factor	Examples
Load	• heavy loads • loads that are difficult to handle – such as long boards or plyboard • loads that are difficult to move or have sharp edges or splinters
Environment	• slippery floors • steps • noisy work being done nearby
People	• not enough staff • poorly trained staff
Tasks	• large reaches up/down/front/side • handling over long distances • where there are few breaks from handling that uses the same movements over and over
Management	• bad impacts of using piece work payment on work pace and shift length • maintenance programmes • management of workflow

See the *Code of Practice for Manual Handling* for more help in identifying the factors that increase the likelihood of hazards happening in your workplace.

Scoring the risk

Using a tool to score all the possible hazards in your workplace allows you to rank them so that you have a clear picture on what to focus on first. Use the Risk Score in the *Code of Practice for Manual Handling* to rank your identified hazards. Once you've completed this you can work out which controls you may need to use or processes you need to change to get rid of or lessen the hazards.

2.4 Good practice for manual handling

Before you decide to introduce any control in your workplace, you need to trial it. This will help you decide whether it's right for your workplace or whether changes are needed to make it fit better with your equipment and processes. Make sure you involve your staff in trials, especially those who'll be involved in working with the control. You should also consider any new hazards your control may introduce.

Worksurface heights

Staff can suffer an injury if they're working at an awkward height for manual handling tasks. The risk happens if worksurfaces are:

- too low for the task, requiring staff to bend forward. This is made worse if they have to use force as well
- too high for the task, which can restrict workers' arm movements and may require them to reach up. Again, this is made worse if they have to use force as well
- too small for the task, which can restrict workers' movements and encourage bad posture
- too large for the task, requiring staff to overreach and carry out work further from their bodies.

These risks increase if the worker:

- doesn't have enough breaks or downtime in which they can recover
- has to carry out the task over a long time
- has to stand in a fixed position or use repetitive movements
- has to use force.

How to minimise the risks

Fixed height worksurfaces

To work out the height for a fixed worksurface you need to take into account:

- the standing elbow heights for both males (1040–1340mm) and females (935–1135mm). Most tasks are carried out somewhere between elbow and knuckle height

- the space needed below elbow height to carry out the tasks. Allow more space if staff have to use force
- the height of footwear soles and whether staff need to stand astride for better balance if they have to use force
- the height of the object being handled, the height at which it will be gripped and the effect of any hand tools being used, eg, hook, pickaroon, strapper
- the heights of any other surfaces the worker will be working with, eg, transferring items from a table to packet.

Off to a good start
No fixed height worksurface will suit everyone. Fix the height at a level that suits most staff. A good starting point to trial for a fixed height worksurface for pulling timber on a long table is 920mm (if you have both male and female workers and timber height is no greater than 100mm).

Adjustable height worksurfaces

Use adjustable height worksurfaces if fixed ones don't suit the worker, and especially if the task requires accuracy, eg, tooling tasks.

You can also use standing platforms so staff can adjust the height to suit them. Make sure the platforms are large enough for all steps of the task. You also need to make sure the platform edges are clearly marked and designed so they can be easily moved and stored when not in use.

Size counts
Make sure you match the width and depth of worksurfaces (not just the height) to the needs of the task being carried out.

Managing fatigue

If staff are required to stand while carrying out tasks you need to control the amount of time they're doing that task. Staff need regular breaks of a reasonable length so that their bodies can recover from the activity. How often and how long these breaks are will depend on the particular task.

Try rotating staff (moving them on to different tasks) to control the amount of time any one worker spends at a given task. You can rotate workers in different work areas or move workers in the same work area on to different tasks.

If you rotate staff, it's important that:

- the number of staff remains the same
- you still have enough staff to cover people who're away (sick leave, appointments)
- everyone is trained in all the tasks you're rotating
- the staff can physically carry out the tasks for the length of the rotation, ie, don't make the task time too long.

Table tasks – workspace design

Sorting tables and packets can cause manual handling hazards. Your staff may be at greater risk of handling hazards where:

- the height at the start or end of a task is outside their comfortable reach. This is made worse if they're having to work against gravity, eg, pulling and lifting boards off the table and up onto packets
- they're having to travel large distances between the table and packets. This means they're carrying more weight and it also increases the time needed for the task
- they're having to restrict their movements or be in uncomfortable positions because of a small work area or obstructions, eg, packets are too close to the table or too close together, or obstructions such as poles and machinery housing are in the way
- the workspace has unnecessarily high levels of friction that require greater force to move the boards, eg, pulling wet boards off a wooden deck
- there's not enough board overhang, so that gripping and pulling boards require them to reach forward and possibly use double movements to get the boards onto the packets. This increases the time needed for the task
- they're at greater risk of trips or falls while moving the boards because of uneven floor surfaces or obstacles, eg, sawdust, broken boards, strapping, fillets.

How to minimise the risks

To reduce the risk of table task hazards you need to make sure:

- staff are able to handle boards at a comfortable height and distance from their bodies
- the distance and lines between tables and packets are not too far
- staff are able to use gravity rather than fight it
- there's as little friction as possible between the board and the table surface.

These factors affect each other. If you change one, you'll need to think about how it affects the others.

Table height

Trial the table height at approximately 920mm (see 'Fixed height worksurfaces' on page 2:8). Make sure the finished packet height is no higher than the final layer of boards above the height of the table. Staff can then use gravity to help move the boards from the table onto the packet.

Use packet risers to help keep the packet height slightly below the table. Staff won't have to bend forward so much to place boards.

> *Make a difference*
> You can make a big difference in your workplace if you use packet risers even just on the jobs that are the most physically demanding, eg, common grades or dimensions, very heavy timber.

Table edges

Try to ensure your tables allow boards to overhang the table edge by an even amount – up to 1m. This will help your staff position themselves closer to the load, stop double handling, make the load weight to be pulled less, and require less force to tip the board down (to gain board speed).

Distances between tables and packets

Try to position tables and packets no more than between 1100 and 1400mm apart. Staff will be able to move boards without big sideways movements, twisting or stepping. It will also cut down the chances of hitting the board ends or packet. You'll need to take into account:

- how far the boards need to be moved up or down the table to the packet
- how long the boards are – longer lengths need more room, shorter lengths less room
- the amount of traffic in the workspace – the space needed for tasks other than pulling boards
- how many packets need to be next to the table.

Reducing friction

To reduce friction between boards and the table surface:

- reduce the surface areas in contact
- install a tilting table
- use low-friction edges and table surfaces
- mount a curved pipe on the table or the table edge
- use roller chains
- keep up good maintenance.

Flooring

Make sure the floor in the workspace:

- is level
- is free from obstructions
- has an even grip surface – this will stop staff slipping and is especially needed if your table is outside.

Handling heavy timber

Many hazards caused by handling heavy materials are easy to spot. But there are other manual handling hazards of working with heavy timber that are caused by:

- the force that staff need to use to move heavy timber off the table. Having to use such force for long periods can overload muscles and joints and result in injury

- staff having to handle a lot of weight at some distance from their bodies. This can cause strain in the neck, back, shoulders and arms
- the size or weight of heavy boards, which makes it hard to place hands under the load and get a good grip. This can be made worse by the need to wear gloves to protect against chemicals and splinters
- the force a worker needs to use to slow, stop or change the direction of heavy boards being pulled off sorting tables
- a mismatch between machinery work pace, such as table speed, and the worker's need to recover before starting the task again. This makes it difficult for staff to keep up the pace over the shift and can lead to tissue damage and injury
- handling heavy material for too long
- handling broken timber.

How to minimise the risks

Adjusting the workplace

Make sure the layout of your workplace is suitable for handling heavy timber.

Think about using machinery to help manage the weight of timber, eg, trolleys, gantries, counterbalances.

Better board handling

Reduce the friction between the boards and the surfaces with which they come into contact. This lessens the force workers have to use to get the board moving (see 'Reducing friction' above).

Consider making the handling of heavy boards (long length 100 x 100mm or larger) a two-person task.

Make sure workers have the best opportunity to get an ideal grip on heavy loads. They need to be able to:

- get close to the load
- get their hands under the load (or place them in the best position for the load)
- use well fitting gloves that grip the load well without slipping.

Work pace and flow

Reduce the work pace when larger, heavier boards are being handled. Base the task cycle time on the time it takes to carry out the controlled handling task along with enough recovery time.

If you can, vary the flow of work so that workers handling heavy boards have spells of handling lighter boards during their shift.

Think about rotating staff between work areas or tasks (see 'Managing fatigue' on page 2:9).

Handling small-sized timber

Not as easy to spot as when handling heavy timber, hazards can also be caused by handling small-sized timber. Because these hazards are harder to uncover you need to give some attention to small-sized timber handling in your workplace.

Your workers may experience small timber handling hazards where:

- the work pace is very fast. The load is lighter and a greater number of items is required to match the volume of larger timber. The faster pace may mean workers are not getting enough recovery time as the task is completed
- the task doesn't change and uses the same movements over and over. Using muscles the same way for long periods wears them out more quickly than tasks that use a variety of movements
- the time to do the task increases. Small-sized timber can be more difficult to place accurately – it has more flex, can more easily get blown around by wind, and is more easily moved out of position. Allow for this in the set task time. Especially make sure staff still have time to recover at the end of the task
- the loads are made more unstable because more boards can be moved at a time.

Give it a rest

When used at a fast pace, even with little force, muscle tissue can suffer injury as it uses up energy faster than it can be supplied. A short time-out between the end of a task and starting again allows blood to get to the muscles being used. This helps recovery.

How to minimise the risks

Task time

When handling small-sized timber, either allow more time for your workers to complete the task or use more workers. Base the time for the task on the time needed for the timber handling, additional tasks (eg, restacking, clearing broken boards) and enough time for the worker to recover.

Work pace and flow

If you can, vary the flow of work so that staff handling light boards, a task that uses the same movements over and over, have spells of less repetitive tasks in handling heavier boards during their shift.

Think about rotating workers between work areas or tasks (see 'Managing fatigue' on page 2:9).

Handling of tooling for woodworking machines

Your staff may face hazards when handling tooling or carrying out maintenance for woodworking. These hazards happen where the load is:

- extremely sharp, eg, blade, cutting edge. This makes it difficult for staff to grip it safely or they may need to use gloves and other protective gear that make it harder to grip or move
- heavy or where staff need to use force to move it, eg, sawdust and delodging blades or machinery that have to be removed more firmly
- difficult to grip – it could be smooth or slippery or there may be no easy hand holds
- difficult to move into or out of position – where staff have to:
  - be in a restricted or unbalanced position
  - lift away from their bodies
  - carry out movements at awkward angles
- in the way of the worker's view of where it has to go, so the worker gets into an awkward or restricted position to get a better view
- bulky or awkward to carry, eg, a bandsaw blade.

How to minimise the risks

Support

Provide support such as trolleys or gantries so that staff don't have to carry the items directly. Whatever support you use, it needs to be able to get as close as possible to the area the item is needed. Keep awkward reaches to a minimum.

Keeping distances down

If items have to be moved into or out of position, see if you can change the work areas so that:

- lifting and carrying distances are as short as possible
- staff can get their bodies close to, and their feet underneath, the load - they then don't have to reach away from the load
- workshops are close to the machines – less carrying and moving are required and there is more time for the task itself.

Number of staff

Think about using two workers for a task or rotate staff to make sure everyone has enough time to recover from physically demanding tasks.

Proper protection

Make sure staff use suitable gloves when handling tooling. Gloves must be strong enough to stop workers getting cuts but not so thick that they make handling or gripping much harder. Look for gloves with a surface that provides good grip for the item. Make sure you have a choice of sizes so all your workers are able to use a pair.

Handling panel products

Panel products, such as plyboard and MDF, create manual handling hazards, very often because of their size. Large products:

- can be difficult to move into a position that's safe to carry
- may require a wide armspan to get a good, stable grip
- can be unstable or become unbalanced, particularly if it's windy
- can be difficult to move when lying flat because the large surface area increases friction
- may be very heavy, with the weight spread over a large area.

You may need to weigh up other panel product handling hazards such as high temperatures or the risk of splinters. You also need to think about whether they create other hazards such as staff slipping or tripping while carrying these large panels because they can't see where they're going.

You can create an injury risk if you don't allow enough time to complete the task and enough time for the worker to recover afterwards. New staff, workers new to the task or workers coming back after an injury may need more time at first to complete the task. Don't forget to allow more time for the task if you add an extra step to the job, eg, an extra inspection step.

Shine a light

Check the lighting and temperature in the work area. Poor lighting and very hot, cold or humid conditions can make it difficult for workers to complete job tasks in the time you've allowed.

How to minimise the risks

A variety of equipment can help lessen the likelihood of hazards when handling panel products:

- **lifting hooks** have an adjustable rod of 600–800mm long with a hook at one end and a handle at the other. Using hooks, one person can move smaller panels without bending or overreaching and the panel can be more stably gripped and handled
- **panel trolleys** are height adjustable, have a tilting bed and locking wheels. One person can use the trolley to move panels with less manual handling
- **low-friction surfaces**. Using these wherever boards are handled manually lessens the amount of force staff have to use to move them
- **vacuum-handling systems**. See whether such equipment is suitable for your workplace for handling panel products. This equipment can reduce handling time, but you'll need to trial it to check it's suitable for the task

Staff training
As with all equipment you need to have training and preventive maintenance programmes in place so that workers know how to properly use and care for the equipment.

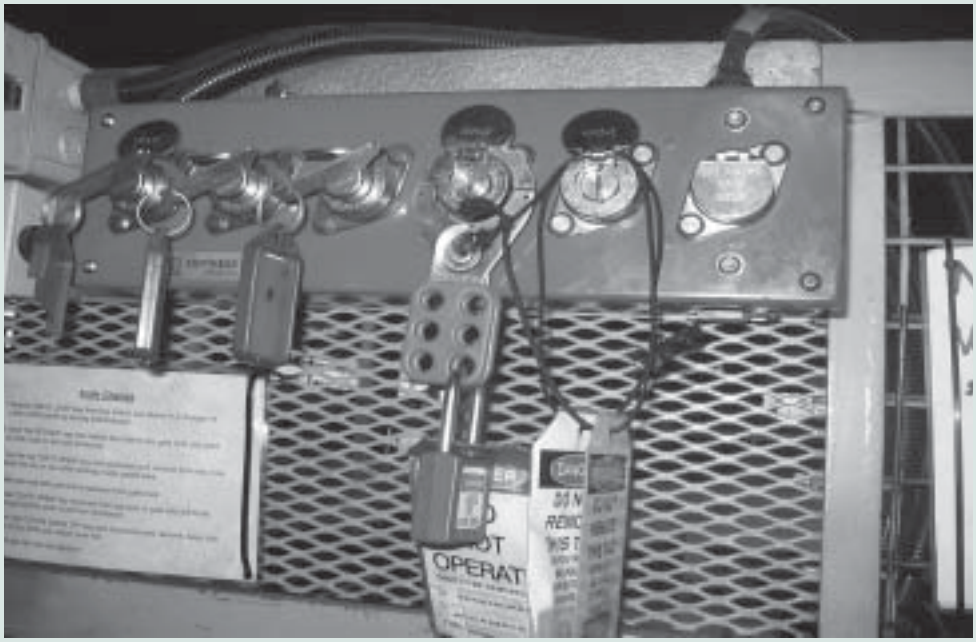
Make sure the training covers not only what's involved in the task but also what the hazards are and how to manage them with safe techniques.

2.5 Further reading

- *Code of Practice for Manual Handling (2001)*. ACC and OSH, Wellington (available from ACC or OSH).
- *Filleting: good practice principles to help prevent musculoskeletal disorders (2003)*. COFHE Report, 4 (3), Forest Research, Rotorua.
- *Musculoskeletal Disorders in Sawmilling: ergonomics work system assessments and suggested interventions (2003)*. COFHE Report, 4 (6), Forest Research, Rotorua.

Section Three

Lockout



3.1 Locking out machinery

What is lockout?

Lockout is where you use a lock or you isolate an energy source to stop your staff being able to operate machinery or equipment.

Every year, workers in New Zealand are killed or seriously injured because machinery or equipment is not properly locked out. For example, accidents where workers are caught in machinery can result in severed fingers, crushed limbs or death. These accidents can be prevented if machinery is locked out properly.

The aim of lockout is to make sure there is 'zero energy'. This is where all sources of energy, including electrical, pneumatic, hydraulic, mechanical and stored energy, are isolated so that moving parts on equipment or machinery can't be activated.

What the law says

Employers, supervisors and employees each have responsibilities for lockout under the Health and Safety in Employment Act. Lockout is important for operators, maintenance staff, contractors, cleaners and any other person required to work near moving parts of machinery.

Case study

A worker noticed that the chains had dropped off the double idler sprocket at the bottom of the sawmill unscrambler. He turned the power off but did not lock out the power source. He then started to put the chains back on the sprocket.

Meanwhile, another worker noticed that the unscrambler was not running and turned the power back on. The machine started up and the worker suffered serious injuries.

A simple, effective lockout procedure would have prevented this injury.

3.2 Identifying hazards

Identifying hazards in your workplace is the first step in making sure your staff are working in a safe environment. You need to work through steps to identify all the hazardous areas in your workplace where locking out machinery will help prevent possible harm or injury.

Do you need a lockout?

Follow these steps in making a decision about whether or not a lockout is required:

1. Decide if there is a risk of injury to your staff from the movement of the machinery or equipment or exposure to an energy source while the activity is carried out. Think of all sources of hazardous energy, such as pneumatic/hydraulic systems and suspended equipment that could roll or fall.
2. If there is no risk of injury, lockout is not required, eg, an operator would normally be in view of their control panel at all times.
3. If there is a risk of injury, decide if any safeguards you're using to protect staff from the risk are working well. If they are, lockout is not required.
4. Make sure that you follow safe work procedures during the activity.

You need lockout
If there is a risk of injury or harm and you don't have safeguards that are working well to protect staff, you need to use a lockout.

3.3 Assessing lockout hazards

In assessing possible risks you're working out how likely it is that hazardous events will happen. It is an important step in focusing your business's efforts to control those hazards and factors that are most likely to cause injury or harm.

See the ACC website (www.acc.co.nz) for ideas on identifying and assessing risks. Look under 'Injury prevention', then 'Safe at work'.

3.4 Good practice for lockout

Once you've decided that lockout is required, follow these next five steps to lock out all sources of energy.

Five steps to lockout

1. Identify the machinery or equipment that needs to be locked out.
2. Shut off the machinery or equipment. Make sure that all moving parts have come to a complete stop. You also need to make sure that you've not created a hazard for other staff by shutting off the equipment.
3. Identify and de-activate (turn off) the main energy-isolating device for each energy source. This may include:
   - disconnecting the electrical power to the pump or compressor
   - closing the valve feeding the cylinder.
4. Put a personal lock onto the energy-isolating device for each energy source so that no part or attachment can be accidentally started or moved.
5. Test the lockout to make sure it's working. (First make sure that all staff are in the clear and that no hazard will be created if the lockout doesn't work.)
   - Test the lockout to make sure you have got zero energy (eg, press the start button).
   - Test to make sure the pump or compressor won't start and that the flow doesn't bypass the valve.
   - Make sure there is no residual (leftover) pressure in the lines, reservoirs or accumulator feeding the cylinder. Get rid of any residual pressure.
   - Check that there is zero energy in the system. You'll need to make sure you've put in place mechanical measures while you're at zero energy, such as mechanically supporting any raised load.
   - Rule out the possibility of an accidental start-up – you must check light beams, pressure sensors and computer-controlled systems that may start up a machine automatically.

Key safety issues

- **Hold cards** – are not best practice for lockout.
- **Emergency stops/electrical interlocks** – must not be used to routinely stop machinery or as a sole method of lockout.
- **Overrun of machinery** – workers must not be able to enter a lockout area until the machinery is stopped and/or you've provided braking systems. As a rule of thumb any machine that takes more than 10 seconds to stop should have a safe entry system in place, eg, a time delay that matches the rundown time on interlocked gates.
- **Switch gear** – access to switch gear must be by authorised persons only. The door to this equipment must be locked at all times.

Working on energised equipment

Sometimes machinery or equipment needs energy for a specific task – eg, when you're making fine adjustments or troubleshooting and you need to have part of the equipment working. In these cases, you should supply energy only to the parts that are vital to the maintenance process.

How to minimise the risks

Work on energised equipment must only be carried out by workers who are:

- qualified to do the work
- authorised by the employer to do the work
- provided with and follow written safe work procedures, eg, permit to work. This may also include extra supervision.

Group lockout procedure

If a number of workers are working on machinery or equipment (particularly if a large number of energy-isolating devices must be locked out) you can use group lockout. Group lockouts save time as they reduce the number of locks required.

How to minimise the risks

Before using a group lockout, a knowledgeable person must plan what is to happen ahead of time and write up a group lockout procedure. You need to put this written procedure up where the system is in use and where staff can easily see it.

Lockouts across shifts

You may need to keep a lockout in place between shift changes.

How to minimise the risks

You need to have procedures that cover this for shift or staff changes. Your procedures need to include the handover of control of the lockout devices between outgoing and incoming staff.

If locks are not left on the control devices between shifts, the staff coming on shift must re-establish the lockout, if needed.

Releasing machines from lockout

Once the work that required the lockout has been completed, the machine can be released from lockout. This must be carried out carefully in a set process that everyone in your workplace knows and understands.

How to minimise the risks

Before releasing a machine to production operations, the staff who put in place the lockout must follow these steps:

1. Remove all non-essential items (eg, tools, spare parts etc).
2. See that all equipment parts are in the correct place for the equipment to operate, including guards and safety devices.
3. Inspect for obstructions, incomplete work, etc. Where necessary carry out a team inspection using trained workers to check specifics, eg, hydraulics, pneumatics.
4. Repair or replace safeguards or safety devices before removing lockouts.
5. Remove each lockout device using the correct removal steps.
6. See that everyone is physically clear of the equipment before energy is switched back on.
7. Develop and follow a special lockout procedure where staff are not available to clear their personal locks because of sickness, absenteeism, etc.

Other hazards

Even if all lockout procedures are followed correctly it doesn't necessarily mean that there are no other hazards present. Be aware of such things as tripping and fall hazards if staff are working at height or in awkward locations. You must provide safe working platforms in all areas staff are likely to go. (See Section One on safe access.)

Case study

A worker turned off the log kickers and entered the machine to undertake work. He had to go in and out of the machine several times. The computer-operated system was programmed to automatically activate the kickers every five logs, ie, every fifth time the light beam was broken. After the fifth time the worker broke the beam, the machine kicked into gear. His injuries included a broken arm and severe bruising. Correct lockout should have included de-activating the light beam/computer control.

3.5 Workplace responsibilities for lockout

Employer responsibilities

The employer is responsible for putting in place the lockout system to be used within the workplace. You must write up the procedures for lockout. Depending on the size and complexity of the operation, you may also need to write up other aspects of the lockout system – eg, emergency lock removal and multiple point lockout. These procedures form part of your health and safety programme.

You must mark or tag each personal lock to identify the person who can use it. For example, the worker's name could be engraved on the lock or you may use a log book that matches the serial numbers of locks to particular workers.

Information and training

You must have safe work procedures for maintenance, cleaners, contractors and production. Anyone working in your workplace must understand and use your lockout systems.

Contractor co-ordination

You must make sure that all contractors meet your lockout requirements before starting a job.

Supervisor responsibilities

The supervisor must ensure that correct lockout procedures are in place and being followed at all times. Supervisors need to record their routine monitoring of operator lockout procedures.

Employee responsibilities

All employees who work on machinery or equipment requiring lockout are responsible for:

- locking out the energy-isolating device
- removing their personal locks on the completion of their work
- keeping control of the keys to personal locks throughout the work.

3.6 Further reading

- *Guidelines For Guarding Principles and General Safety for Machinery (1995)*. OSH.
- *Guidance Notes for Electrical Interlocking for Safety in Industrial Processes (1994)*. OSH.
- *AS 4024.1 : 1996 : Safeguarding of machinery*.
- *European Standard, EN 1037 : 1995 : Prevention of unexpected start-up – a comprehensive discussion of energy dissipation, isolation devices, locking devices and design strategies to prevent unintentional start-up*.

Section Four

Machine Guarding

4.1 Making machine operations safe

What is machine guarding?

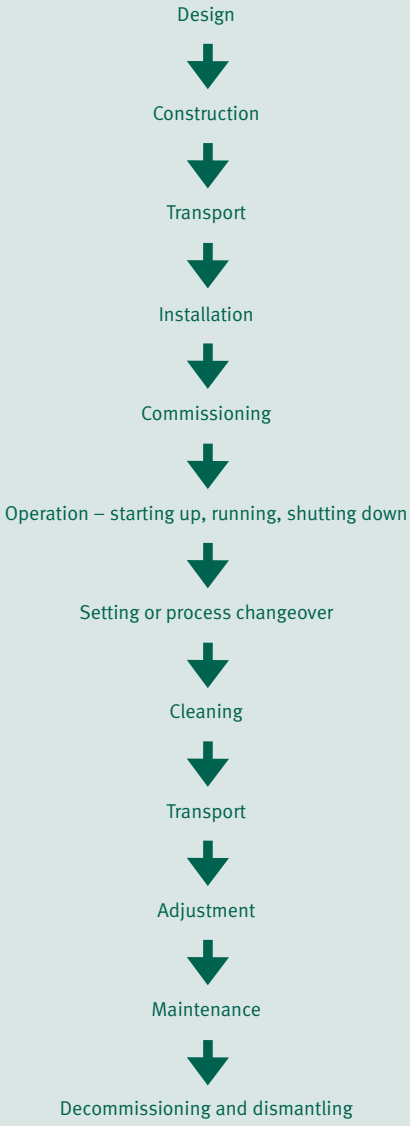
Every New Zealand workplace using machinery must provide guards to protect workers from moving or dangerous parts on those machines. As you'll discover from these guidelines guards need not be complicated, nor make your business less productive.

These guidelines are based on the Australian standard AS 4024.1 : 1996 : Safeguarding of machinery. The standard sets out why guarding is important and how to identify hazards and risks throughout a machine's life cycle. The standard also describes how to remove or lessen these risks through both using guards and safe work practices.

In this section we have provided general advice on good machine guarding practices rather than specific advice for different types of machinery. This information is purely a guide. You can use other methods to improve staff safety, provided the protection you offer is equal to or better than the requirements of AS 4024.

The life cycle of machinery

Hazards can occur at all stages of the machine life cycle. Some hazards will be the responsibility of the designers, manufacturers and suppliers. Others are yours.



What the law says

The law requires employers to keep a safe workplace. Following the good machine guarding practices set out in this section will help you meet your legal obligations under the:

- *Health and Safety in Employment Act 1992*
  - Section 6 Employers to ensure safety of employees
  - Sections 7-10 Employers shall ensure there is an effective method for identifying and controlling hazards
  - Sections 12-13 Information for employees about hazards/training and supervision
  - Section 18A Duties of persons selling or supplying plant for use in a place of work including loaning of plant
  - Section 19 Employees to ensure their own safety and that no action or inaction causes harm

- *Health and Safety in Employment Regulations 1995*
  - Section 11 Noise
  - Section 18 Protective devices for woodworking machinery
  - Section 56 Machinery (no employee under age of 15 shall work on any machinery…)
  - Section 66 Duties of designers of plant
  - Section 67 Duties of manufacturers and suppliers of plant

Sharing responsibility

It's not only sawmills and wood processing plants that have to make sure the machinery they use is safe. Section 18A of the Health and Safety in Employment Act 1992 says anyone selling, supplying, leasing or loaning plant to workplaces has a responsibility to make sure that plant is safe for use.

Make the best start
Right from the start, you should only buy machines that have all safety features, eg, braking systems and guards.

Go back to your supplier if the machine they've supplied does not meet reasonable guarding standards (check the manufacturer's specifications and instructions for guarding details). You can tell the supplier that they're responsible for supplying machines that are safe for use. For you to have any grounds on which to go back to the supplier you must be using the machine for the purposes it was made.

If you see a problem with a machine that's widespread, contact the supplier. But also, let your industry association and OSH know so they can alert other employers.

4.2 Identifying hazards

Identifying hazards in your workplace is the first step in making sure your staff are working in a safe environment. You need to work through a process to identify all the machine hazards in your workplace and decide how likely it is that any harm or injury will happen.

A process to deal with machine hazards

Looking for risks

To identify hazards, walk through all your business's work areas and identify machinery in which moving or exposed parts could cause injury. Ask your staff to do the same but have them read these guidelines first to get an idea of what to look for.

You may also find it helpful to have someone else who works in the industry look through your work area.

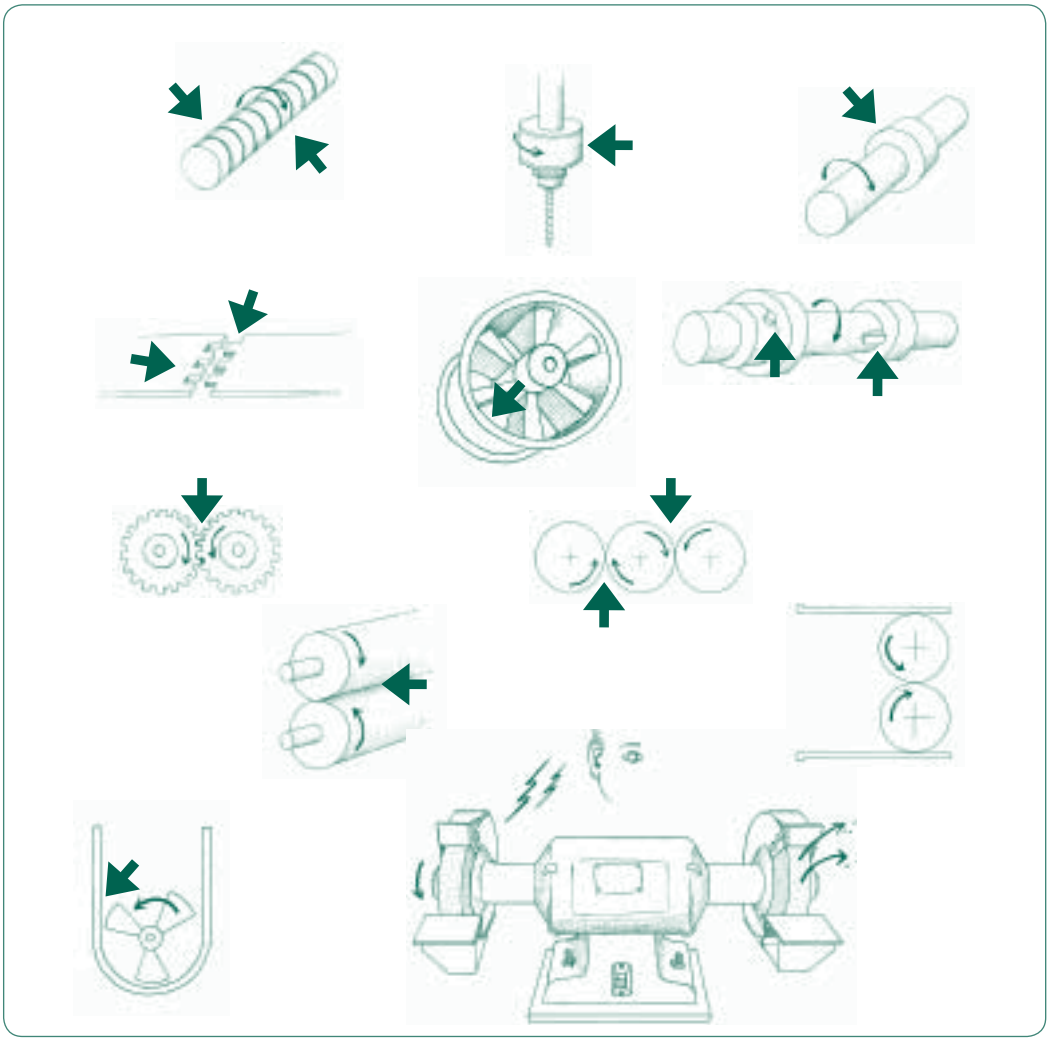
In going through this process you should think about both short- and long-term solutions. Guarding a machine may be the best solution now, but long term, replacing the machine with an improved model with all the safety features may be the best option.

When buying new machinery, check out the safety features and try to get the suppliers and manufacturers to fit guards to meet your particular needs.

Common hazards to check for

Machine hazards are likely to fall into these categories:

Potential hazard	Likely to happen...
Trapping	• in-running nip on a conveyor
Cutting	• sharp parts of machine
Impact	• being hit by the machine
Shearing	• guillotine-type action
Entanglement	• revolving shafts
Heat/chemicals	• glue machines
Radiation	• dryers
Noise	• a multi-head planing machine
Electrical	• control equipment



4.3 Assessing machine hazards

To assess possible risks you need to work out how likely it is that hazardous events will happen. This allows you to put your efforts into dealing with those hazards and factors that are most likely to cause injury or harm.

The Australian standard *AS 4024* contains detailed information on the risk assessment process. The steps below are a brief guide to risk assessment as set out in *AS 4024*. They point out some of the key elements of good practice that you can use in assessing risk in your workplace.

Risk assessment process

Things to think about

To decide how severe the injury or harm a hazard may cause, you need to think about:

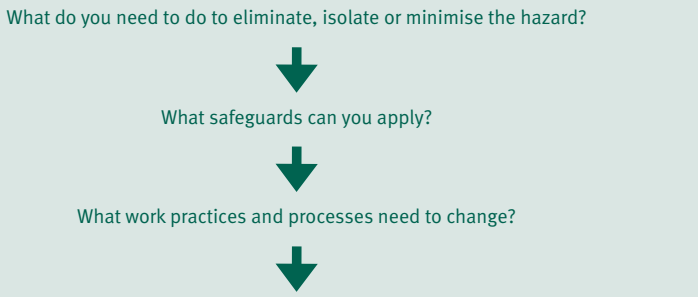
- what you're protecting
  - people – operators, maintenance personnel or anyone else
  - property
  - environment
- how severe the injury is likely to be
  - slight injury or damage to health, eg, the person will recover
  - serious injury or damage to health, eg, the person may not recover
  - extreme, where the person dies
- how likely it is the hazardous event will happen
  - how often people come into contact with the machine and for how long (consider all your business activities) processing, training, maintenance, cleaning, shift changeover
  - the accident history of the machine – don't assume that a history of 'no accidents' automatically means low risk
- whether it's possible to avoid or limit the risk, eg, through using only trained staff on the machine
- the likely speed at which the event is likely to happen – sudden, fast or slow
- whether staff are able to avoid injury or harm – by escaping or reacting
- how aware staff are of the risk.

When carrying out a risk assessment you need to think about more than just the technical factors. The training, experience and ability of your staff can affect risk. Work practices, work conditions and environment also affect the likelihood of a hazard causing injury or harm.

4.4 Good practice for machine guarding

Where you identify hazards and decide that there is a significant risk of their happening you need to work through a process to control them.

A process to deal with machine hazards



The best thing you can do to improve workplace safety is to get rid of (eliminate) hazards. If that's not possible, you should think about how you can isolate them, which may include using safeguards. If that's not possible, you need to think about how you can change work practices and processes to lessen injury and harm.

Things to consider...

- Whether you can change your processes or product design so that you don't need the machine.
- Whether you can isolate the operator from the machine, eg, create a secure control room.
- Whether you replace the machine with a model that has all the safety features.

Using machine guards

Where you're unable to eliminate or minimise the hazard, you need to consider measures that will protect your workers from the hazard. Machine guards can provide protection.

The type of safeguard available will depend on the type of operation you have, how you handle your product, the physical layout of your plant, and your production and access needs.

The different types of guards include:

- fixed guards – including nip guards
- guarding for conveyors
- interlocking guards
- presence-sensing devices – including trip guards
- self-adjusting guards

- distance guards/fences
- partial guards.

Hazards may not require guarding if they are 'safe by position', ie, they are either over 2.4m high or are in a position that, at all times, means they can't be reasonably reached.

The following pages look at these different guards and where you should use them.

First things first

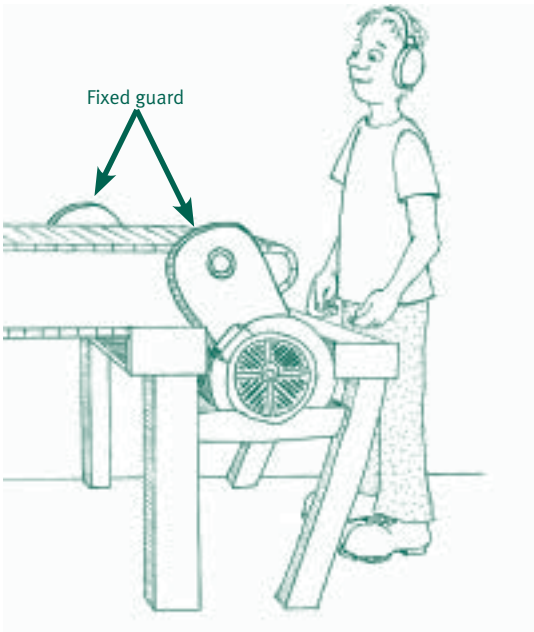
The layout of your work area affects whether or not machine guarding will prevent accidents. For example, if your machines are too close together, machine guarding may not improve safety at all.

A good factory layout:

- has clear and simple flow lines so staff aren't near dangerous machinery unless they need to be and are unlikely to be in the wrong place at the wrong time
- avoids congestion and keeps worker activity away from machines that could cause problems
- keeps the collection of rubbish, materials and clutter away from machines
- keeps to a minimum the movement of trucks, people and machines
- discourages operational hazards such as blocked access during cleaning or maintenance.

Fixed guards

Fixed guards are the most widely used. They're good for providing protection at the direct source of the hazard.



✘ Unguarded conveyor

✔ Guarded conveyor

How to minimise the risks

Guards should be:

- robust and made out of material suitable for the situation. Mesh is a good choice because you can see the belts and chains and it allows air flow
- designed so you can carry out some maintenance without removing them, eg, a recessed guard allows you to grease the machine without removing the guard or extend the grease points
- colour coded so you can easily recognise them when they're removed
- kept in good condition. List the guards on your hazard register so they're included in your regular check of hazards and controls
- bolted securely so that a tool is required to remove them. Wingnuts or similar fixings are not suitable. You can use hinge guards where the guards are too difficult or heavy to remove fully, but they too must be secured so that a tool is needed to remove them.

See *AS 4024.1* for the standards required for guards.

✘ Chain drive not fully guarded

✔ Fully guarded chain drive

Follow the rules

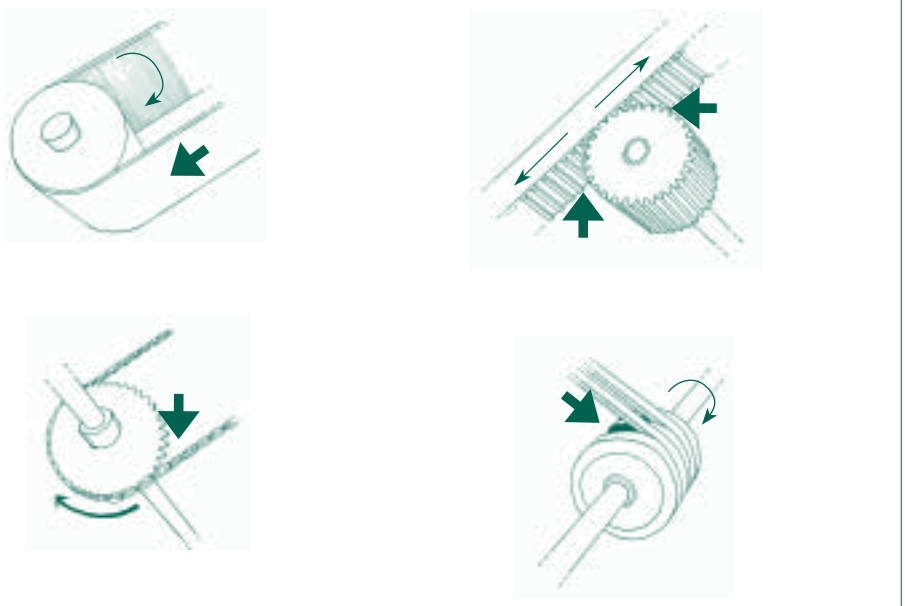
Have a work rule that ensures machines are not operated unless the guards are securely in place.

Nip guards

Wherever there are chains sprockets, belts, pulleys or drives, there are usually in-running nips, which can be a hazard.

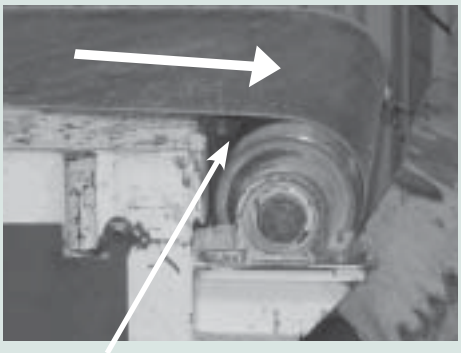
How to minimise the risks

Use guards to enclose the danger zone.



Guarding of conveyors

With their moving parts, conveyors can cause accidents. For example, timber on a conveyor may cause a trapping point when it hits a stop.



✘ In-running nip needs guarding

✘ Nip points on belt need guarding

How to minimise the risks

Sometimes you can use a nip guard instead of full machine guards. You can only do this where the machine has no other hazards.

Beware of reversing conveyors. They have in-running nips at the points shown. It's safest to fully enclose the danger zone.

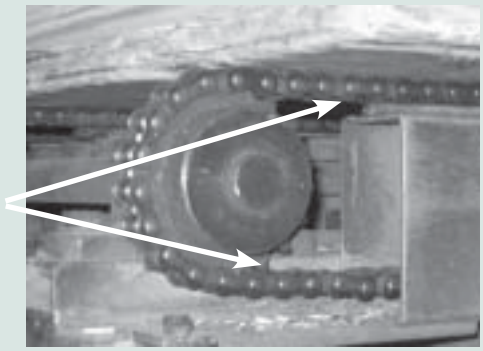
Guards must only be removed when the machine is locked out (see Section Three of these guidelines on lockout). Guards should be designed so that it takes longer to remove them than it takes for the machine to run down.

Risky clothing and hair

You need to consider more than just applying guards to make sure your staff are safe around conveyors. Staff should not wear loose clothing and long hair needs to be tied up and out of the way.

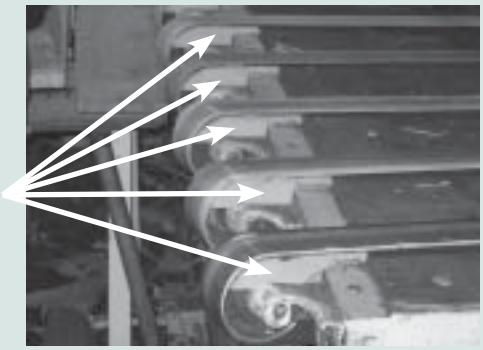
HAZARD!

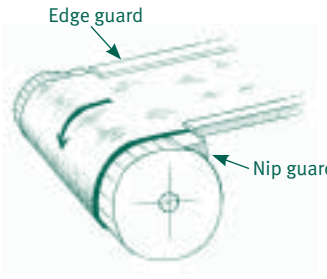
✘ It's often better to fully enclose the in-running nips on reversing conveyors

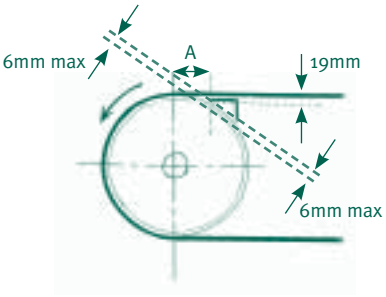


Nip guards protect danger zones

Note: Distance between nip guards and belt must be no more than 6mm







Double check
Watch out that when you introduce a guard you don't create another hazard. When first using a guard you need to work through the risk assessment process again (see page 4:8) to make sure the new guards are actually reducing the hazard risk and not creating new ones.

Revolving shafts

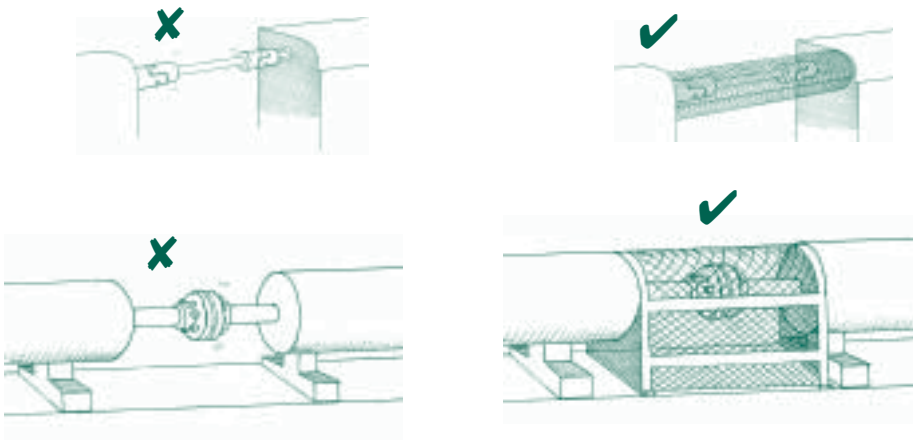
How to minimise the risks

You must guard revolving shafts. In some situations you can use a loose-fitting guard (such as a power take-off guard on a tractor).

The **only** situation where you don't need to guard a revolving shaft is where the shaft stub is less than 20mm and the shaft is smooth and has no protruding parts.

HAZARD!

✘ Shaft needs to be guarded or cut off

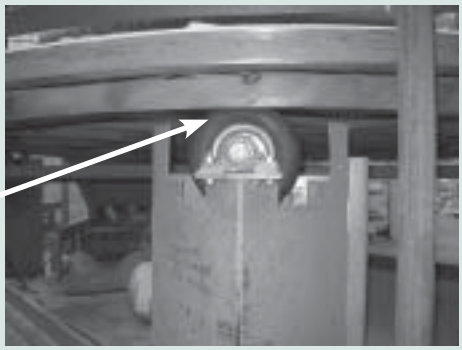


Idle rollers

Idle rollers can trap workers.

HAZARD!

✘ A nip guard is needed

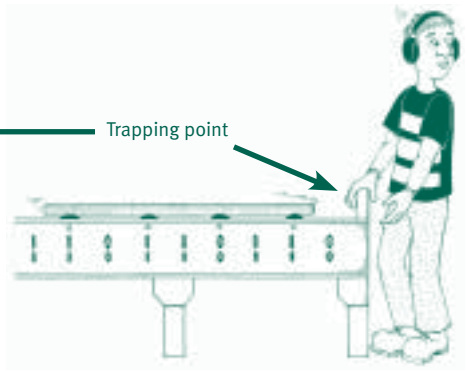


How to minimise the risks

You need to guard the danger zone around idle rollers. The only situation where you may not need a guard is where the idle roller has little tension – like on the return of a conveyor. **But you must check** to make sure there is no hazard.

Other hazards

Look for hazards that are created by timber or other product hitting 'stops' or sides of conveyors, etc



Interlocked guards

An interlocked guard is connected with the control system – the interlock stops the machine operating unless the guard is closed. These interlocks are usually electrical, mechanical, hydraulic or pneumatic.

How to minimise the risks

The guard itself must not re-start the machine when it is closed. The machine must only be able to be re-started from the control panel.

Interlocked guards must not be able to be overridden.

Safe isolation

You must not rely on interlocked guards as the only means to isolate a particular machine. Your staff need to operate under full isolation/lockout procedures before they enter an area with interlocked guards or gates.

✔ Interlocked control room door

In the photo above, the operator is enclosed in the control room. The door to the danger zone is interlocked with a timer that makes sure the machine has stopped completely before anyone can enter.

Presence-sensing devices

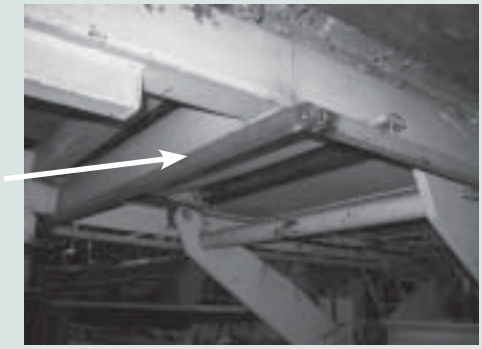
Presence-sensing devices stop all moving machine parts when they detect that a person or something has entered the danger zone. The devices will only allow the machine to be re-started when the person or object is removed.

Presence-sensing devices include photoelectric light curtains, laser scanners and pressure mats.

Trip guards

Trip guards are a type of presence-sensing device. Trip guards work in a variety of ways to prevent staff coming into contact with the danger zone.

✔ Scissor lift protected with a trip guard



Check that again

Carry out a risk assessment with the machine in full operation to make sure all the hazards are controlled by the trip guard, including any hazards created by the guard.

Self-adjusting guards

Self-adjusting guards enclose the blade until a cut is being made.

✔ Self-adjusting guard on a dropsaw

How to minimise the risks

Think about using self-adjusting guards for docking saws, rip saws and cross-cut saws.

Distance guards/fences

Distance guards use a barrier or fence to prevent workers coming into contact with the danger zone.

How to minimise the risks

Make sure that any gates or doors of a distance guard around a machine are kept locked, or instead, use an interlocking guard (see 'Interlocked guards' on page 4:15).

Partial guarding

If you can't completely guard a machine, eg, a circular saw or planer, you can use partial guards.

How to minimise the risks

If you use a partial guard you must also use other safety measures to protect staff, such as requiring them to wear personal protective gear.

Try that again

When you move machines or change processes you need to go back to the start and carry out a full risk assessment on the machine or process to make sure the control measures are still effective.

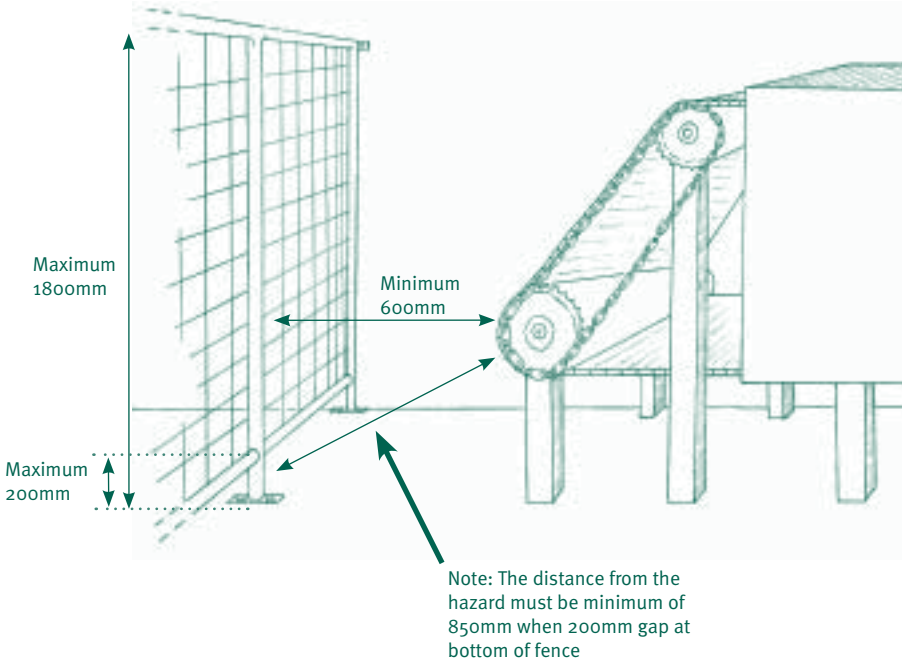
Fencing

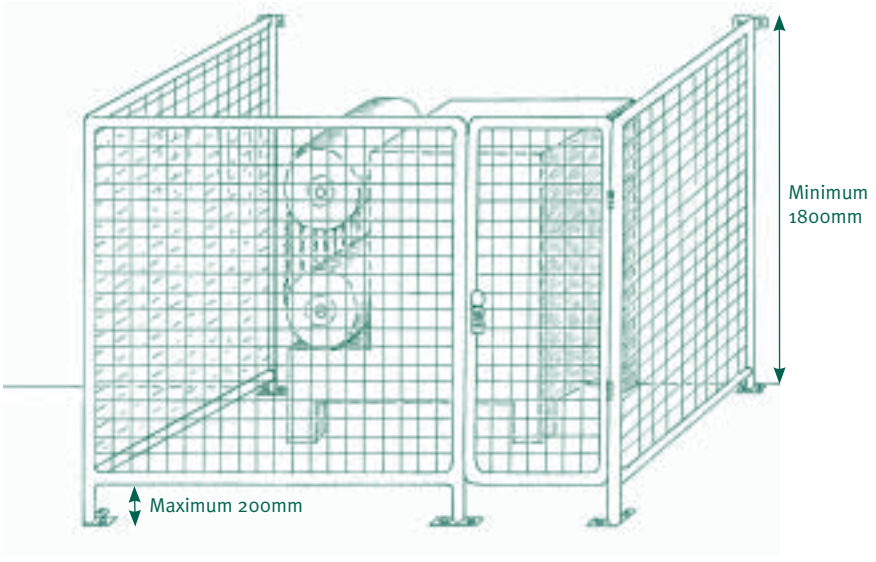
If a machine has a number of hazards, your best option may be to fence off the machine entirely, rather than try to guard all the dangerous parts. Fencing may also work best if you need easy access to the machine.

How to minimise the risks

To meet requirements fencing must:

- be 1800mm high
- have a gap of no more than 200mm from the ground
- provide a gap of at least 600mm from the machine hazard – there are some exceptions: see *AS 4024.1* if you need the fence closer.





See *AS 4024.1* for the standards for fences.

✔ Fencing gates restricting access to hazardous areas

For high-use areas or where a number of workers need to use the machine, think about using an interlocked gate with an isolation/lockout procedure that stops the machine on entry. This is likely to be better practice (and cheaper) than guarding all the hazards.

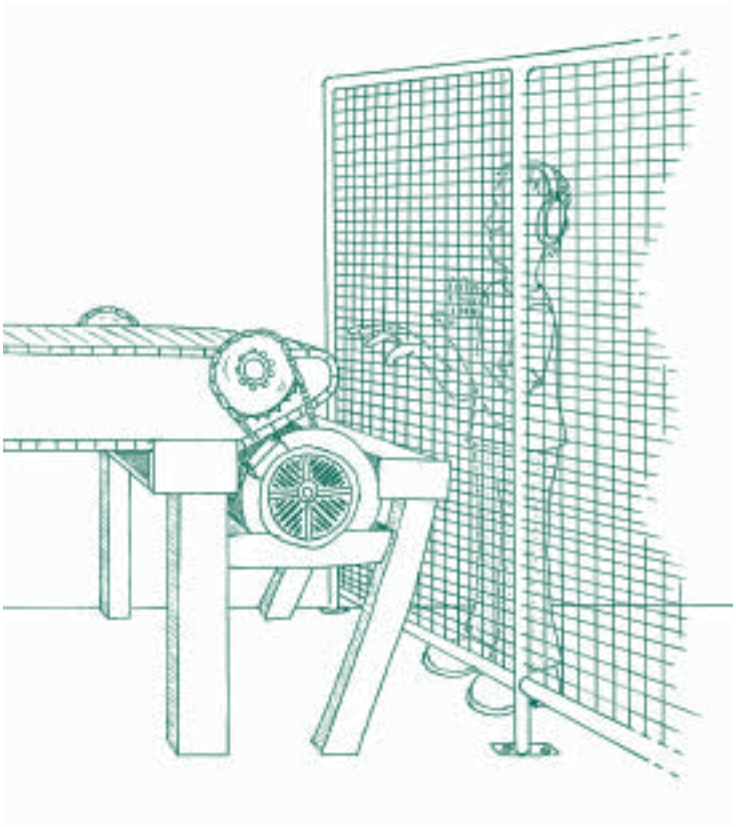
If you don't often use the machine, you could instead use a lock and key. But you need to restrict who can get the key and you need to put up a sign on the fence stating, 'No entry until isolated'.

Move it and save

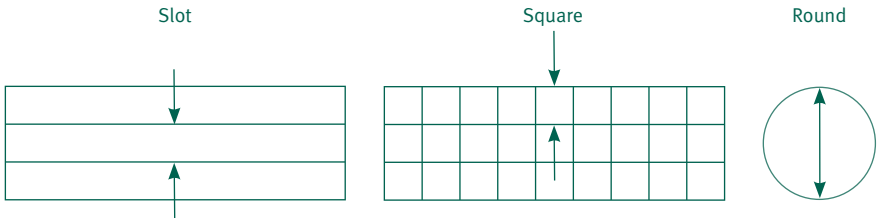
If you have a machine that needs fencing, consider moving it against a wall. This may reduce the amount of fencing you need.

Setting fence and guard distances

Working out the right distance to place guards and fences is called ergonomics. Ergonomic studies have identified the distances 'most people' can reach under, over, around or into.

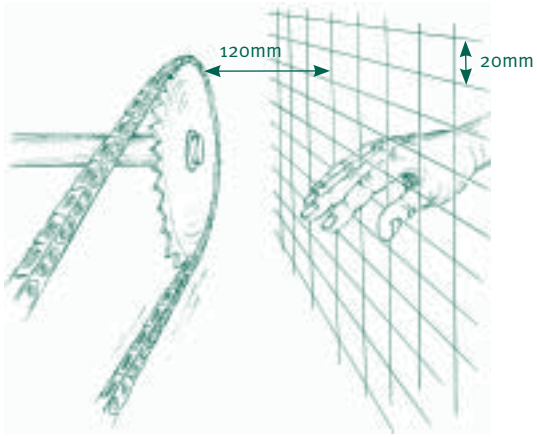


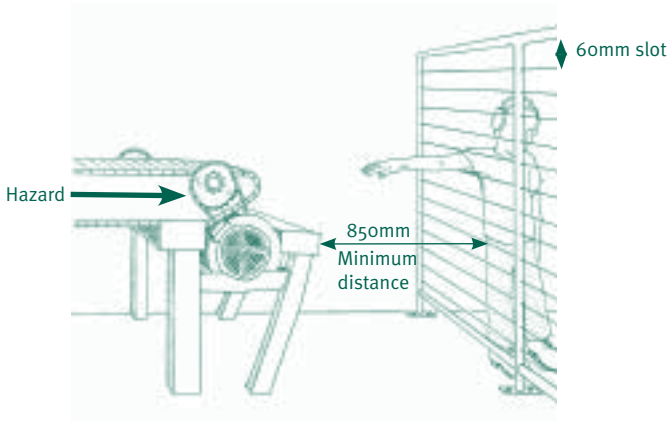
AS 4024 sets the distances from hazards of three types of openings: **slots**, **squares** and **rounds**.

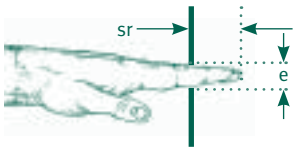
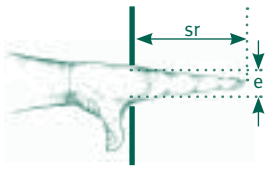
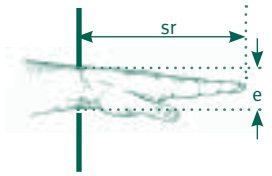
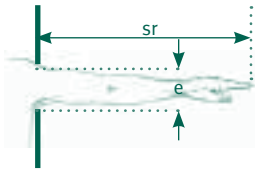


The distances for each type are measured as follows:

	Minimum distance from hazard for:		
Openings of	**Slots**	**Squares**	**Rounds**
0 to 6mm	10mm	5mm	5mm
7mm – 8mm	20mm	15mm	5mm
9mm – 10mm	80mm	25mm	20mm
11mm – 20mm	120mm	120mm	120mm
21mm – 30mm	850mm	120mm	120mm
31mm – 40mm	850mm	200mm	120mm
41mm – 120mm	850mm	850mm	850mm
Note: Some values allow a greater safety margin than that allowed by AS 4024.1			


120mm
20mm


60mm slot
Hazard
850mm
Minimum
distance

Part of body	Illustration	Opening	Safety distance sr		
			Slot	Square	Round
Fingertip		e ≤ 4	≥ 2	≥ 2	≥ 2
		4 < e ≤ 6	≥ 10	≥ 5	≥ 5
Finger up to knuckle joint		6 < e ≤ 8	≥ 20	≥ 15	≥ 5
		8 < e ≤ 10	≥ 80	≥ 25	≥ 20
		10 < e ≤ 12	≥ 100	≥ 80	≥ 80
or hand		12 < e ≤ 20	≥ 120	≥ 120	≥ 120
		20 < e ≤ 30	≥ 850	≥ 120	≥ 120
Arm up to junction with shoulder		30 < e ≤ 40	≥ 850	≥ 200	≥ 120
		40 < e ≤ 120	≥ 850	≥ 850	≥ 850

See *AS 4024.1* if you have any openings greater than 120mm.

Administrative controls

There is a range of measures you need to think about using, along with physical guards. The measures explained in the following pages are the very least you should do to improve safety for staff working with machines.

Signage

If you're unable to lessen a hazard risk in any other way, at least put up warning signs.

See Section One of these guidelines on safe access for more details on signage requirements.

Inspection, cleaning and maintenance

Regular inspection, cleaning and maintenance of machines are the basic steps you can take to make your workplace safer for your staff.

You must isolate or lock out any machinery that is being worked on or cleaned. (See Section Three of these guidelines on lockout.)

Make sure that all your workers understand what is required so these tasks can be carried out safely.

Requirements of Health and Safety in Employment Regulations 1995

You need to check the operation of your workplace's machinery meets the Regulations' requirements. The Regulations cover:

Machine	Must have...
Breast bench and circular saw	• riving knife and push sticks
Cross-cut circular saw, eg, radial arm saw	• a limiting device that prevents the saw moving beyond the edge nearest the operator • device to prevent rebounding and adequate handholds
Thicknesser, edger	• anti-kickback fingers or similar
Overhand planer	• a cylindrical cutting block and cutter behind the fence to be guarded
Foot-controlled machines	• effective cover with sufficient clearance for the operator's foot, or • an effective locking device

Stress and fatigue

Staff can lose their concentration and react more slowly if they've been working long hours or for long periods without proper breaks. This increases the likelihood of their making mistakes. Excessive heat, poor air flow and poor operator comfort (eg, bad seating positions, awkwardly located controls) can also cause loss of concentration.

There may be other stresses in the workplace that you'll also need to manage. See the OSH guideline on *Healthy Work – Managing Stress and Fatigue in the Workplace* on the OSH website (www. dol.govt.nz).

Lighting

You can decrease the likelihood of injury and harm happening if you make sure the area around machines is clearly lit. Think about the:

- direction and intensity of lighting
- contrast between background and local lighting
- colour of the light source
- reflection, glare and shadows created by the lights
- strobing effect of fluorescent lights on moving machinery. (It can make moving parts of machinery look as if they're stopped.)

See *AS/NZS 1680.2.4 : 1997 : Interior lighting – Industrial Tasks & Processes* for more detailed information on good lighting practice.

Noise

You need to take whatever steps you can to lessen the level of noise in the workplace.

Noise, particularly excessive noise, can create hazards. It can make communication difficult, which can cause confusion. Noise can also cause a worker to lose concentration or cause

them stress, which can lead them to make mistakes. Workers exposed to excessive noise, even for short periods, may suffer permanent hearing loss.

If you can't avoid high noise levels, make sure your staff wear properly fitting hearing protection that's suitable for the noise level. Often the use of well designed guards for moving parts can help lessen the noise and reduce its stressful effects on your staff.

Double up
Maybe you can double up on your sound proofing and guarding measures – an acoustic hood that features an interlock can help both lessen a hazard and reduce noise.

Ventilation (air flow)

Make sure your machines and workers are getting enough air while working. Some processes and machinery produce heat, which can cause staff to feel tired and slow their reactions.

Using well designed guards that include mesh will allow air flow to keep your machines (and your staff) from overheating.

Training/supervision

Training your staff on the correct and safe way to operate machinery makes it less likely they'll have an accident involving injury or harm. Make sure that everyone (whether they're supervising, managing or operating the machinery) is given the right training for health and safety.

Don't assume...
That a worker knows the safe way to operate machinery or that they can just pick it up as they go.

You need to train staff in how to operate machinery safely and the actions they need to take to control hazards while operating the machinery, such as making sure guards are in place at all times machines are operating. Training also needs to cover the personal protection gear that may be needed.

Isolation

Except for the circuits of safety systems, you need to fit all your machinery with a means for isolating them from all power sources. Make sure these isolating devices are easy to see and to get to. It's important that you are able to lock these isolating devices. See Section Three of these guidelines on lockout for more information.

Operational and emergency stop controls

Make sure operational controls and emergency stops are easy to see and easy to get to and that they're clearly labelled.

Emergency stop devices must have handles, bars or push buttons that are coloured red and can be got to immediately if there's an accident.

Emergency stop buttons should be the 'mushroom' type and not recessed into the machine.

Trip wires should be easy to operate and, if they use a single switch, there must be a tensioning spring at the opposite end. If the trip wire breaks or there is any other fault, it should 'fail to safety'.

If you have machines that are operated by foot controls, these controls must be shrouded to avoid starting up accidentally.

A large machine may need a number of control switches. These must be of the 'stop-and-lockout' type.

If you have machines where more than one worker is operating the machine at the same time (such as on production lines and conveyors) the machine must have more than one set of control switches.

Machine operating checks (see checklist next page)

The machine operating checklist (Section 4.5) is a useful tool for operators, supervisors and managers to undertake a risk assessment for both existing and new machinery.

Use the checklist to carry out assessments annually or whenever machines or processes change.

4.5 Machine Operating Checklist

Undertake a check for each machine.

Machine:	Date of Inspection:	Name:

1.0 Machine hazards	Yes	No	Action
1.1 Do the guards prevent workers' hands, arms, and other body parts making contact with dangerous moving parts, eg, unguarded gears, sprockets, pulleys, shafts or flywheels on the machine?			
1.2 Are there any trapping points between the product being processed and the machine?			
1.3 Are the guards firmly secured and require a tool to be removed?			
1.4 Do the guards permit safe, comfortable, and relatively easy operation of the machine?			
1.5 Can the machine be oiled/greased without removing the guard?			
1.6 Is the machine free from obstructions and does it have good access?			
2.0 Machine controls	**Yes**	**No**	**Action**
2.1 Are starting and stopping controls within easy reach of the operator?			
3.0 Isolation/lockout/interlocking	**Yes**	**No**	**Action**
3.1 Is there a system for isolating the machine before guards are removed?			
3.2 Are maintenance and cleaning workers trained in the requirements of isolation/lockout?			
3.3 Are interlocked guards tested to ensure they are working?			
3.4 Is there ability for multiple lockouts?			
3.5 Does the machine overrun more than 10 seconds?			
3.6 If yes to Q 3.5 are there controls to prevent access eg, time delay?			
3.7 Are all sources of energy isolated eg, electrical, hydraulic, pneumatic?			
3.8 Are isolations tested by attempting to start the machine?			

4.0 Ergonomic/environmental hazards	Yes	No	Action
4.1 Is there signage for operating controls and warning of any uncontrolled hazards?			
4.2 Are there any 'danger zones' within reasonable reach?			
4.3 Have appropriate measures been taken to safeguard workers against noise hazards?			
4.4 Do maintenance workers lock out the machine from its power sources before beginning repairs?			
4.5 Are there manual handling issues that require awkward movements or handling heavy loads?			
4.6 Is there good ergonomic seating provided for the operator?			
4.7 Is there good lighting?			
4.8 Are there other environmental hazards, eg, dust, fumes, mists?			
5.0 Training	**Yes**	**No**	**Action**
5.1 Do operators and maintenance workers have the necessary training in how to use the safeguards and why?			
5.2 Have they received an induction?			
5.3 Have operators and maintenance workers been trained in how and under what circumstances guards can be removed?			
5.4 Have workers been trained in the procedures to follow if they notice guards that are damaged, missing, or inadequate?			
5.5 Are the guards included in the hazard register?			
6.0 Personal protective equipment	**Yes**	**No**	**Action**
6.1 Is protective equipment required?			
6.2 If protective equipment is required, is it appropriate for the job, in good condition, kept clean, and stored carefully when not in use?			
6.3 Is the operator dressed safely for the job, ie, no loose-fitting clothing or jewellery?			
6.4 Can the existing guards be improved?			
6.5 If yes to Q 6.4 how?			

Section Five

Further Information

5.1 Further information

Accident Compensation Corporation (ACC)	www.acc.co.nz
Occupational Safety and Health (OSH)	www.dol.govt.nz
Timber Industries Federation	www.nztif.co.nz
FITEC (Industry Training Organisation)	www.training.org.nz
Standards New Zealand	www.standards.co.nz