

GUIDE TO MACHINE SAFETY

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1.INTRODUCTION

There are many kinds of machines used in Mens Sheds and it is everyone's job to manage the risks associated with the use of machinery and equipment.

This Guide to Machine Safety provides information to help you to manage risks with using machinery (plant) in your shed.

This guide uses a range of examples and will help you to:

- identify the hazards;
- understand how you can reduce or remove risks using various controls; and
- check responsibilities with new and old machines.

It is important to have a culture of safety where people can speak up about safety in the shed, report and monitor near misses.

2. IDENTIFY COMMON HAZARDS AND MACHINE PARTS THAT NEED SAFEGUARDING

Safeguarding machinery must prevent an operator's or a passer-by's access to danger areas or prevent the risk of machine (plant) parts being ejected.

Typical hazards or the dangerous parts of machines, include:

- In running rollers that 'draw you in'
- Shear points
- Flying ejected parts
- Moving parts that can bump and knock
- Hot and cold surfaces

The risk:

- Impact and crushing
- Cutting
- Entanglement
- Stabbing
- Abrasion

Machine parts that are hazardous which require safeguarding include:

- Belts and pulleys
- Gear wheels
- Shafts and spindles
- Flywheels
- Slides and cams
- The tools and dies of power presses
- Blades of guillotines
- Milling cutters
- Circular saws
- Drills and chucks

3. REMOVE THE HAZARD AND/OR CONTROL THE RISK (SAFEGUARD CONTROLS)

The most effective way to manage the risk is to remove the hazards.

For example, an in-running nip can sometimes be eliminated by moving the rollers further apart or by running one roller in the opposite direction.

Where eliminating the hazard is not possible, the risks must be controlled or safeguarded, so far as is reasonably practicable.

Bypassing or disabling of the guarding, whether deliberately or by accident, must be made as difficult as is reasonably practicable. Guards must be kept in an effective state that prevents access to the dangerous parts of the machine.

Four main ways to safeguard machines are:

- barriers that physically prevent access to the hazard or the hazard reaching a person;
- presence sensing devices which removes the hazard, for example, by the stopping when a person is accessing the hazardous area;
- designing machine operator controls that prevent the operator reaching the hazardous area; and
- administrative controls if other types of controls are not practicable. In most cases, a combination of controls is used to control the risks.

BARRIERS

Permanent guard (inherently guarded)

Permanent guards are integrated into the design and should never be removed.

Fixed and interlocked guards

Often, using permanent guards is not practicable as the hazardous areas need to be accessed for various reasons, including cleaning, setting up and maintenance.

If frequent access to the danger area is necessary during operation and isolation of the energy is not practicable, interlocked physical guards should be fitted. The machine will not operate until the guard is fully closed. They can be electrical, mechanical, pneumatic or hydraulic.

If frequent access is not required, fixed guards may be fitted.

Fixed guards should not be able to be removed without using tools. Tools used to remove the guard should only be available to members who are authorised to remove the guard or maintain the machine.

Moving parts of some machines continue to run even after the power is removed. The guards of these machines should remain locked, after the action is taken to deactivate the dangerous function until the moving parts comes to a standstill.

Generally, danger areas should not be accessed without isolating the power to the machine and removing the stored energy (from gravity, compressed air or accumulators).

Sometimes the machine should be run to undertake cleaning, setting up or fault tracing. To do these activities, these machines should be able to run at a slower speed and operate only by pulsing or using a hold-to-run control. The interlocking system could automatically switch the machine into safer mode when the guard is opened.

A key operated service switch to change the running mode may be appropriate in some situations.

If you find a fixed guard has been removed or interlock has been defeated, investigate the reason for not fitting it back or defeating the system. In most cases these arise from the need to frequently access the area to rectify a problem. Based on the findings, implement a long- term solution to the problem or install an interlocked guard where appropriate.

Make regular checks of the functions of the interlock system.

Reliability

The level of reliability of presence sensing or interlocking system (safety integrity level or the performance level) should be in line with the level of the severity of the possible injury.

Tunnel guards

Tunnel guards are used typically when material being processed needs to flow through the machine. The guard should be long enough to prevent a person reaching the danger point. This concept is similar to the approach distances in the section on reach.

Adjustable guards

Adjustable guards are used when the entire danger areas could be isolated, for example, an opening is required to feed the work piece, into a band saw or a table saw.

The guard should be adjusted for the minimum possible gap for each job being processed.



Table saw without guard



Table saw with guard

Self-closing guards

Self-closing guards open: The cutting edge of a drop saw or circular saw only opens to the extent necessary to cut the worked on piece.



Drop saw without a self-closing guard



Drop saw with a self-closing guard

Combination guarding

Sometimes a combination of control measures is the most effective way of providing the necessary protection. This could be a combination of fixed guarding, presence-sensing, distance fencing or perimeter fencing.

Design considerations of guards

Materials

- Guards may be made from imperforated sheets, particularly if parts to be guarded do not need to be ventilated or seen.
- Where visibility or ventilation is necessary, rods, bars, mesh or transparent material can be used. Rods and bars should be fitted parallel to the direction of movement of the parts to be observed by the operator.
- The guard must be of solid construction and securely mounted so, as to resist impact or shock and avoid using light brittle material.
- Where there is a risk of flying or ejected parts, the strength of the material should be sufficient to contain the parts.

Opening size

- If mesh, rods or perforated sheets are used, workers should not be able reach the danger point through the openings.
- Make sure the size of openings and clearances take ergonomic factors into account. While the reach distances in this guide will help you do this, the main aim is to prevent a person reaching the danger point. For example, the danger point should be more than the length of the arm away from the mesh if the arm could be inserted through the openings.

Access

- Make sure that guards allow maintenance workers to safely get access to the machine. Guards should be designed so that routine maintenance procedures (such as lubrication) can be carried out without removing the guards.
- No new hazards
- Make sure that new guards do not create a new hazard. For example, fixed guards should not have sharp or jagged edges.

Not harder to operate

- Make sure that guards allow the operator to carry out normal duties comfortably. A guard that makes the machine more difficult to operate is usually removed or disabled.

TWO HAND OPERATIONS

Where the use of guards or presence sensing devices is not practicable to isolate all danger areas, two hand operation may be implemented to prevent the hands of the operator reaching the danger area. Both operator controls should be activated at the same time, typically within half a second (0.5 sec).

Two hand operation can protect only the operator; other members could approach the danger zones and be at risk. The risks to other persons should be controlled by other control measures, procedures and supervision.

ADMINISTRATIVE CONTROLS

Administrative controls are the least preferred way of managing risks as human behaviour is not reliable. These controls involve procedures, training and supervision and includes setting up adjustable guards.

4. EXAMPLES OF GUARDS AND BARRIERS

1- PRESENCE-SENSING SYSTEM

How it works

Presence-sensing systems, which include light curtains, safety mats and laser scanners, are connected to the control system of the machine so that it will not operate if the beam of light is broken (e.g. by the operator's hand reaching into the danger zone).

The response time of the presence-sensing system should be shorter than the time a body part takes to reach the hazard from the sensing zone.

When permanent or fixed guards are not practicable, interlocked presence sensing devices may be used.

Presence sensing devices and their associated safety systems take time to bring the danger area to a safe state. When using presence sensing devices, place the sensors far enough away from the danger zone (approach distance), to allow time for the system to respond.

Check the functions of the presence-sensing safeguarding system on a regular basis.

2– MECHANICAL INTERLOCK

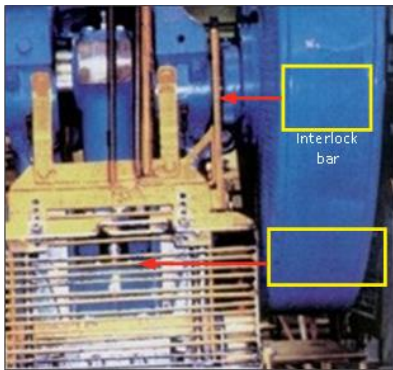


Photo A

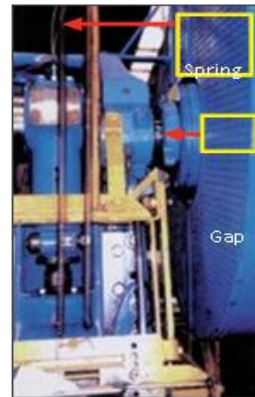


Photo B

Photo A shows the mechanical interlock bar (yellow bar) of a power press. The bar is connected to the front movable guard below which moves up and down with the bar. The spring shown in photo B raises the guard when released preventing stroking (press cycle).

To operate the press, the guard is lowered which in turn lowers the interlock bar as shown in photo B. The pedal is pressed to operate the press through one cycle. This allows the clutch to engage the stroke by sliding across the gap where the interlock bar was allowing the press to stroke.

Raising the guard to remove the work piece will automatically re-insert the mechanical interlock bar into the gap preventing further stroking.

3- PARTIAL GUARDING

In some cases, it may not be possible to fully guard a machine. In such cases, the machine should be guarded as completely as is possible.

Table saws present many hazards. These include nip points on belt drives, over heating the electric motor when covered with saw dust, cuts from the cutting blade, inhaling saw dust and noise particularly when the material is cut.

This is an example where a combination of control measures is used to manage different hazards associated with one machine. The table below shows some examples of the hazards and possible control measures.

4. Table– Hazards and possible control measures of table saws

HAZARD	CONTROL MEASURE
Nip points on the belt drive	Install fixed guards
Overheating dust covered motor	Clean the motor area regularly
Fixed guards are difficult to remove and takes time to remove and replace. These difficulties may discourage the operator from cleaning	Interlock the access door to the belt drive
Need to get into an awkward posture to reach the motor to clean	Use a brush with a long handle
Using the brush makes the operator maintain an awkward posture for a long time	Use a vacuum cleaner
Saw dust reaching the breathing zone of the operator and other around the saw	Fit a mechanical dust extractor
Extractor may reduce the amount of dust settling in the area thereby reducing the intervals of cleaning of the motor area	
Saw dust settling on walls and roof which can cause dust explosion	Fit a mechanical extractor that can collect the dust
Operator can reach the cutting edge of the blade from the top	Fit an adjustable guard. Train and supervise the operator
Operator's hand gets closer to the blade when cutting the operator end of the work piece	Provide a push stick, train and supervise the operator
	Provide a location on the machine for the push stick
Blade shatters when the push stick hits the blade	Use a push stick made from soft material such as plastic or timber
Work piece kicking back	Install a riving knife slightly wider than the width of the blade, behind the blade
	Operator to stand away from line of work piece feeding
Noise generated when cutting	Wear hearing protection

5. OTHER CONTROL MEASURES

As well as fixed guards, interlocked guards, presence-sensing safeguarding system, two-handed push button controls and partial guarding, more examples of controls are:

- Distance guard
- Trapped key
- Specific types of controls for in-running rollers

Other issues

These are not guarding issues but, should be considered and controlled when machines are installed and used:

- Noise
- Hazardous chemicals
- Airborne contaminants
- Falls
- Electrical
- Lighting
- Hazardous manual tasks
- Hazardous atmospheres
- Falling objects

1 SAFETY PROCEDURES

Consult supervisors and operators when preparing any safety procedures for machines and tasks.

2 TRAINING

Shed management committees must ensure the members receive correct training about the hazards of machines they operate and about safe working procedures. Training is particularly important if it is only possible to partially guard a machine.

3 ADMINISTRATIVE MEASURES

The management committee should, on a regular basis, inspect guarding, maintain guards and maintain machinery in a safe and effective condition.

6. PERSONAL PROTECTIVE EQUIPMENT (PPE)

If the guarding system does not completely control the hazard then protective equipment, such as eye protection, must be provided.

Make sure that:

- It complies with Australian Standards and has the “Standards Australia” symbol on it
- It fits comfortably and gives adequate protection
- Provide training in how to use it correctly
- It is properly maintained
- It is used properly.

Operators should avoid wearing gloves when working with machinery with moving parts (such as lathes) as the gloves may get caught in the machine or make it more difficult to operate controls.

7. MAINTENANCE WORK PROCEDURES

Isolation procedures must be used when maintenance workers enter the danger zone to carry out repair work.

Before they enter the danger zone each maintenance worker must ‘lock out’ or ‘tag out’ the machine to prevent it being accidentally switched ON while anyone is working on it. This includes electrics, hydraulics and pneumatics.

8. BUYING AND SELLING MACHINES

1 BUYING A NEW MACHINE

Buy new machines that have proper guards. Check for risks and control them after you have installed the machine, and before you start using it for production.

Guards 'designed into' equipment are usually more effective than guards fitted after the machine has been installed.

2 BUYING AN OLD MACHINE

When buying an old or second-hand machine, ensure the supplier provides appropriate guarding for the machine as required by the legislation. Check this before installing and/or commissioning the machine.

After the machine is installed and before using the machine you should assess the machine to identify any further hazards. If you identify any hazards, implement control measures for the risks from those hazards before placing the machine into production.

3 SELLING OLD MACHINES

You must ensure, so far as is reasonably practicable, that plant is without risk to health and safety of persons who at the workplace use the plant for the purpose it was designed or manufactured.