BUSINESS PROCEDURE

Workshop Machinery Safety

OHS-PROC-167

This document applies to:

Brisbane Office	☐	FEITH	☐	GFE Projects	☒
Iron Flow Battery SPS	☐	Meandu Mine	☐	Non-Operational Land	☐
SAMCo	☒	Stanwell Battery	☐	Stanwell PS	☒
Tarong Battery	☐	Tarong Site	☒	Wambo Wind Farm	☐
Wivenhoe Pipeline	☒				

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1.0 Purpose/Scope

This procedure defines Stanwell's minimum requirements for workshop machinery safety and guarding, including guarding selection, design, and installation.

This Business Procedure applies to all employees and contractors of Stanwell and its subsidiaries, and visitors to Stanwell workplaces. Where reasonable and practicable, additional or alternative requirements prescribed by a Client (where Stanwell or its subsidiary is engaged as a Contractor) must be adhered to, provided minimum legislative requirements are also satisfied.

This procedure does not apply to the guarding of plant and equipment located outside a designated workshop (e.g. guarding of coal conveyors) and does not apply to portable and powered hand tools nor welding equipment.

2.0 Actions

As a minimum the following shall occur:

- all workshop machinery shall comply with the relevant Australian Standards and Stanwell requirements;
- all Original Equipment Manufacturer (OEM) supplied safety devices must be installed and maintained as part of the safe operation of the machine;
- all hazards and risks associated with the maintenance and operation of machinery must be identified and appropriate controls implemented, refer to *Risk Evaluation Matrix (GOV-STD-11)*;
- the workspace around a machine work-zone shall be kept clean, tidy and free of obstacles, slip, trip and fall hazards, rubbish and the like;
- machinery shall have a method for full isolation and stored energy dispersal;
- where machine stability cannot be achieved by inherently safe design measures such as weight distribution, it must be maintained by the use of protective measures (e.g. anchorage bolts);
- machinery shall be subject to scheduled audits and inspections;
- operational information, service manuals and other related documentation shall be in English and made readily available (hard copy or online); and
- safety related devices such as emergency stops, light curtains, and guard interlocks shall be periodically tested and the results recorded.

3.0 Safe Work System Requirements

Prior to operating workshop machinery, a Workshop Machinery Operator is required to undertake a personal risk assessment (i.e. Safe Start or equivalent).

To prevent accidental start-up or movement of a machine mechanism, workshop machinery must be isolated for any maintenance, repair, installation, service or cleaning work that requires the method of machine guarding or interlocking to be bypassed or removed. Additionally, as part of the isolation process, machinery stored energies should be de-energised e.g. releasing the tension of spring-loaded parts. In this context, activating machinery operational stop buttons, emergency stop devices or interlock devices is not equivalent to the isolation of power sources, or the release of stored energy.

4.0 Work Environment Requirements

4.1 Signage and Labelling

Signs and labels must be suitable for the intended purpose. Where signage requires instant recognition in a critical situation, signage and labelling should consider the use of universal symbols (pictograms), in addition to a written message. Where symbols are used for signs, they must adhere to *AS 1319-1994 Safety signs for the occupational environment*.

Machinery that requires personal protective equipment (PPE) for its operation shall have appropriate signage on or near the machine.

All affected persons should be advised prior to new signs being introduced or existing signs being amended, such as in pre-start meetings, toolbox talks, inductions and by other suitable means.

5.0 Plant and Equipment Requirements

5.1 Guarding Controls

The use of guards (and protective devices) is required where a machine's inherently safe design does not sufficiently minimise the risks to the health and safety of workers and others.

The functions of guards include:

- prevention of access to the space enclosed by the guard; and/or
- containment/capture of materials, workpieces, chips, liquids which can be ejected or dropped by the machine, and reduction of emissions (noise, radiation, hazardous substances such as dust, fumes, gases) that can be generated by the machine.

The introduction of, and any modifications to, workshop machinery and associated guarding must be managed through the *Plant Modification Request (PMR)* process and comply with the requirements of this procedure, relevant legislation and Australian Standards.

5.1.1 Types of Guards

There are several types of physical guarding and protective devices available for the guarding of machinery. Each have different operating principles and therefore are suitable for different safety applications. The range of safeguarding devices includes:

- permanently and securely fixed physical barriers;
- distance barriers;
- interlocked physical barriers;
- presence sensing equipment;
- self-closing guards; and
- two-hand control devices.

For further detail on different guarding types, refer to Appendix A – Types of Machinery Guards.

5.1.2 Selection Criteria for Machinery Guarding

5.1.2.1 Risk Assessment

In all instances, the selection of guarding for a particular machine must be based on the outcome of the risk assessment for that particular machine and the hazards present. For a

detailed list of machinery hazards, refer to Appendix B – Mechanical Hazards of Workshop Machinery.

5.1.2.2 The Intended Use of the Machine

The selection of guarding must be based on the intended use of the machine. That is, the use for which the machine is suited according to the information provided by the manufacturer, or which is deemed usual according to its design, construction and function.

5.1.2.3 Geometry of Hazards

The geometry of hazards associated with the machine must be considered when selecting guarding, including the:

- dimensions of the 'line of fire' area;
- angle and energy of projectiles;
- relative position of personnel from the source of the hazard; and
- reaching distances with different parts of the body.

5.1.2.4 The Nature and Frequency of Access to the Danger Zone

The below hierarchy is to be used for the selection of new or modified guards based on the nature and frequency of access to the danger zone of the machine:

- If a person would not need either complete or partial access to the danger zone during normal operation, maintenance or cleaning of the plant, the guarding is to be a **permanently fixed physical barrier**;
- If a person may require complete or partial access to the danger zone during normal operation, maintenance or cleaning of the plant, the guarding is to be an **interlocked physical barrier**. The interlocked physical barrier allows access to the area being guarded at times when that area does not present a risk and prevents access to that area at any other time;
- If it is not reasonably practicable to use a permanently fixed physical barrier or an interlocked physical barrier, the guarding used is to be a **physical barrier securely fixed** in position by means of fasteners or other suitable devices sufficient to ensure that the guard cannot be altered or removed without the aid of a tool or key;
- If it is not reasonably practical to use any of the above guards, a **presence-sensing guarding system** is to be used.

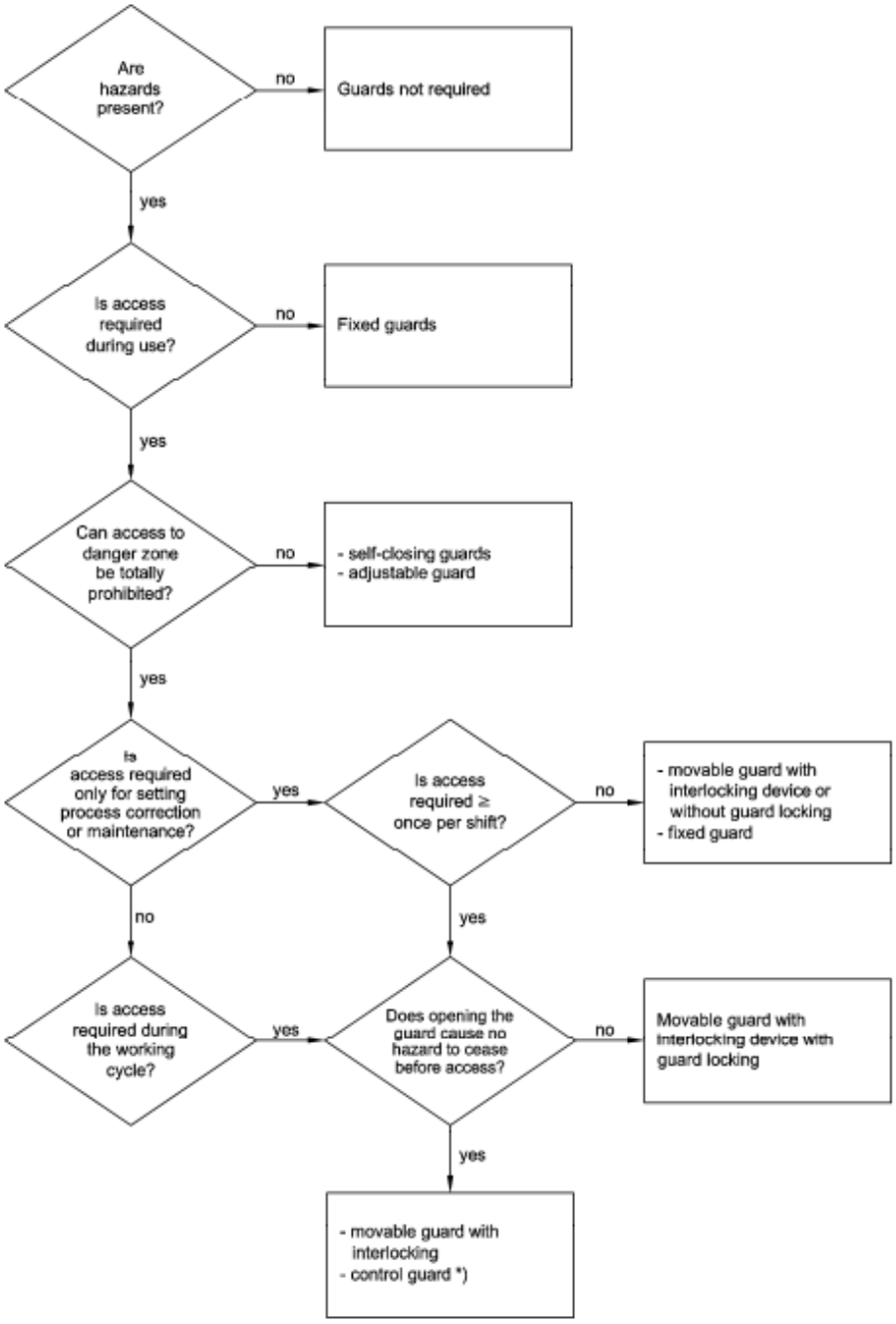


Figure 1: Selection process of machine guarding

Where guarding of any moving part of the machinery or plant does not eliminate the risk or it is not practicable to implement a guard, it must be ensured workers or other people do not operate or pass close to the moving part **unless a safe system of work is in place** to reduce the risks as far as practicable.

5.1.3 Combination of Guards

It may be often appropriate to use a combination of different guards to ensure the safe operation of machinery. This may be the case where a machine has several different danger zones and access is required to one or more of them during the operating phase.

Figure 2: Combination of machine guarding

5.1.4 Guard Design Requirements

Where Stanwell is the designer and/or manufacturer of machine guarding, it must be ensured it is safe for its intended use and meets legislative requirements. Details of these safety requirements should be part of the original equipment manufacturer (OEM) manual for the relevant machinery or other relevant reference material.

As far as is reasonably practicable, the design of machinery guarding must also:

- pose minimal interference with normal operating activities;
- be of a robust construction;
- not introduce an additional hazard;
- not be easy to by-pass or render non-operational;
- be located at an adequate distance from the danger zone;
- cause minimal obstruction to the view of the production process;
- be designed to allow maintenance, housekeeping, inspection, servicing, set-up tasks and other necessary operations to be carried out safely without the need to remove the guard or protective device; and
- designed into the machine and its process relative to the risk associated with its operation.

5.2 Emergency Stop Controls

An emergency stop shall be fitted to all workshop machines that are part of an electrical installation. There are two main types of emergency stop devices:

- an emergency stop push button (refer to detailed requirements in Appendix C - Emergency Stop Push Buttons); or
- an emergency stop pull-wire also known as a lanyard.

All personnel have the authority to stop plant in the event of an emergency using the 'Emergency Stop' devices provided. The circumstances surrounding the emergency will determine the initial and follow-up actions.

Where an emergency stop function is fitted for enabling actual or impending emergency situations to be averted, the following requirements shall apply:

- the emergency stop must be clearly identifiable, clearly visible and readily accessible;
- the hazardous process must be stopped as quickly as possible without creating additional hazards; and
- the emergency stop shall trigger, or permit the triggering, of certain safeguard movements where necessary.

5.3 Workshop Machinery Inspections

The scheduling of Annual/ Return to Service Inspections and Safety Reviews is to be established and managed by the Workshop Responsible Person in Stanwell's Enterprise Assessment Solution (i.e. Ellipse), with records retained in Content Manager.

5.3.1 Annual & Return to Service Inspections

Workshop machinery shall be periodically inspected to ensure their condition remains safe and serviceable, refer to Appendix D - Machine Inspection Tool.

The inspection process will be conducted on an annual basis and will address serviceability of operational and safety components.

Where machinery has been removed from service for any reason (maintenance, repair, safety issues, etc.), a return to service (RTS) inspection shall be conducted to ensure plant has been returned to a safe condition e.g. all guards appropriately reinstated.

5.3.2 Safety Review

Every five years a safety review of workshop machinery will be conducted to verify the inspection process, establish contemporary compliance of safety features, and re-confirm workshop machinery management processes. Refer to Appendix E - Safety Review Tool for the template to be utilised.

The Workshop Responsible Person is to coordinate the safety review process, and where required, engage the Health, Safety and Environment Team for involvement.

5.3.3 Pre-start Inspection

In addition to formal inspection processes, workers are required to inspect workshop machinery prior to operation to confirm their safe condition.

5.4 Hiring & Purchasing of Workshop Machinery

All hired and newly purchased machinery must be inspected by the Workshop Responsible Person (or delegate) prior to being operated on site to ensure compliance with all relevant Australian Standards, Stanwell requirements and relevant codes of practice.

6.0 Safe Work Practice Requirements

The minimum standards applicable for the safe operation of specific workshop machinery is contained within the following Stay Safe documents:

- *Lathe (OHS-PROC-167A);*
- *Band Saw (OHS-PROC-167B);*
- *Cold Saw (OHS-PROC-167C);*
- *Pedestal and Radial Drill (OHS-PROC-167D);*
- *Guillotine (OHS-PROC-167E);*
- *Abrasive Cut-off Saw (OHS-PROC-167F);*
- *Hydraulic Press (OHS-PROC-167G);*
- *Milling Machine (OHS-PROC-167H);*
- *Linishing Sander (OHS-PROC-167I);* and

- *Fixed Grinder (OHS-PROC-167J).*

These Stay Safe documents are to be located in the vicinity of each relevant machine for easy reference by a Workshop Machinery Operator. These Stay Safe documents also serve as the basis for machinery familiarisation processes (as determined by Sites) and pre-start inspection requirements.

6.1 Supervision

All permanent work areas containing workshop machinery must have a Workshop Responsible Person nominated in control of that area or of the workgroup primarily using that area.

The level of supervision of workshop machinery operation at any point in time will consider the following factors:

- the type of work being conducted; and
- the worker's level of experience, including:
  - documented qualifications that demonstrate experience, ability and competency in the safe use of the machinery;
  - specific knowledge of the safe and correct use of the machinery;
  - area specific induction / machinery familiarisation; and
  - experience (i.e. previous involvement and familiarity) in the safe use of the machinery.

Trainees, apprentices and personnel without formal and accepted trade qualifications can operate workshop machinery:

- after completion of the relevant area specific induction (including familiarisation/s); and
- under the direct supervision of an appropriately qualified worker.

7.0 Training and Competency Requirements

Persons who use workshop machinery are to have the necessary experience, ability and competency in the safe use of that machinery.

Sites may restrict access to permanent workshops (or areas within a workshop) to authorised persons (i.e. by swipe card access) which may require the completion of an area specific induction.

Employee training records will be retained in the Stanwell Learning Management System.

7.1 Specialised Workshop Machinery

Persons conducting unsupervised work using specialised machinery for precision work, for example milling machines or lathes, must be familiarised and hold trade-based competencies equivalent but not limited to:

- MEM18003C: Use tools for precision work
- MEM07011B: Perform complex milling operations
- MEM07021B: Perform complex lathe operations

8.0 Documentation

- All documentation of the Annual / RTS Inspection and the Safety Review will be retained in Content Manager and managed in Ellipse.
- OEM operational manuals will be accessible either electronically or located in the relevant workshop.

- All maintenance records should be retained in Content Manager.
- All workshop machinery-related records should contain the available machinery identification (i.e. make, model, serial, year of manufacture, asset number).

9.0 Responsibilities

9.1 General Manager

The General Manager must ensure this procedure is implemented within their area of responsibility by delegating tasks and responsibilities to relevant Managers.

9.2 Manager

Managers have an overarching responsibility for the workshop(s) in their area of control and the provision of adequate resources to fulfil the duties stated in this procedure.

Managers are responsible for the appointment of a Workshop Responsible Person/s for each permanent workshop (or workshop area) containing workshop machinery and ensuring the appointment is recorded in the Stanwell Learning Management System.

9.3 Workshop Responsible Person

The Workshop Responsible Person is responsible for the:

- coordination of the Annual / RTS Inspections and Safety Review of machinery within their appointed workshop or workshop area, and ensuring scheduling of these are established in Ellipse;
- management of workshop inductions as per the relevant Site process and tool;
- inspect hired and newly purchased machinery prior to being operated on site to ensure compliance;
- authorise the risk assessment for any task that can only be completed with the machine guarding removed to ensure suitable controls are implemented and the guarding immediately reinstated;
- management of records and corrective actions resulting from the above inspections and reviews, as well as the record management of maintenance activities.

9.4 Workshop Machinery Operator

Workshop Machinery Operators are responsible for the safe use of workshop machinery, including:

- completing a pre-start inspection of machinery and personal risk assessment (i.e. Safe Start) prior to use;
- removing and actioning out of service, faulty and/or non-compliant machinery;
- reporting any workshop machinery hazards, near hits or incidents;
- familiarisation of workshop machinery prior to use as per Site process; and
- where required, have completed any relevant area specific induction/s.

10.0 Review, Consultation and Communication

Review:

This document is required to be reviewed, as a minimum, every 5 years, or more frequently if required, through change in Legislation, Australian Standards or workplace practices.

Consultation:

Personnel consulted/communicated with during the review of this document may include relevant HSE team members, HSE committees (if operational processes change), appointed

Workshop Responsible Persons, as well as any other personnel who have an interest or expertise in the process.

Communication/Requirements after Update:
This Business Procedure will be communicated to sites via GenNet.

11.0 References

- Work Health and Safety Act 2011
- Work Health and Safety Regulation 2011
- GOC State Archives – Public Records Act
- AS4024.1 (Series) – Safety of Machinery
- AS1319-1994 - Safety Signs for the Occupational Environment
- Guide to machinery and equipment safety, Workplace Health and Safety Queensland
- Safe use of machinery, Worksafe New Zealand

Document No	Document Title
GOV-STD-11	*Risk Evaluation Matrix*
OHS-PROC-167A	*Lathe Stay Safe*
OHS-PROC-167B	*Band Saw Stay Safe*
OHS-PROC-167C	*Cold Saw Stay Safe*
OHS-PROC-167D	*Pedestal and Radial Drill Stay Safe*
OHS-PROC-167E	*Guillotine Stay Safe*
OHS-PROC-167F	*Abrasive Cut-off Saw Stay Safe*
OHS-PROC-167G	*Hydraulic Press Stay Safe*
OHS-PROC-167H	*Milling Machine Stay Safe*
OHS-PROC-167I	*Linishing Sander Stay Safe*
OHS-PROC-167J	*Fixed Grinder Stay Safe*

12.0 Definitions

Word / Abbreviation	Definition
Danger Zone	Any area around or within a machine where an exposed person could be at risk of injury, such as being caught in moving parts, struck by objects, or exposed to hazards like hot surfaces or electricity.
Emergency Stop	A function which is intended to avert arising or reduce existing hazards to a person, damage to machinery, or to work in progress, and is initiated by a single human action.
Guard	Part of a machine specifically used to provide protection by means of a physical barrier. Depending on its construction, a guard may be called casing, cover, screen, door, enclosing guard etc.
Guard - Temporary Guarding	A shield, fence, enclosure, cover, casing, mesh and other similar enclosing device that is used in place of the original guarding which may have been removed to facilitate access. The safe provisions of a temporary guard shall be the same as the original guard and is set in place for a defined period. Note: Temporary guarding is not to permanently replace the original guard.
Line of Fire	Any area where a person is at risk of injury when in the path of a hazard, such as a moving object or release of hazardous energy.
Machinery	Assembly, fitted with or intended to be fitted with a drive system consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application.
OEM	Original Equipment Manufacturer.
Nip Point	Also known as a pinch point, is a hazard that occurs when two adjacent parts of machinery move towards each other and have the potential to capture or draw in foreign objects.
Protective Device	Safeguard other than a guard.
PMR	Plant Modification Request; a formal process to propose and document any addition, removal, substitution or amendment to the configuration of the; process, strategy, equipment, software, hardware, systems, physical environment, materials, products, irrespective of cost or magnitude, that is not "like for like" or "replacement in kind".
RTS	Return to Service.
Workshop Responsible Person	A person appointed by a Manager who is in direct control over the delegation and management of work which utilises machinery within a designated workshop (i.e. Superintendent or other person).
Workshop Machinery	For the purposes of this procedure, workshop machinery includes a lathe, bandsaw, cold saw, pedestal and radial drill, guillotine, abrasive cut-off saw, hydraulic press, milling machine, linishing sander, and fixed grinder.

13.0 Revision History

Rev. No.	Rev. Date	Revision Description	Author	Endorse/Check	Approved By
0	09.05.2019	Document created	Balazs Bagyinszki	Owen Bevan	James Oliver
1	22.03.2022	Document updated with Appendix D & E that were previously controlled forms. Review of content in procedure not undertaken.	Natasha Harding	Natasha Harding (for consolidation group)	Letitia Lucke

Rev. No.	Rev. Date	Revision Description	Author	Endorse/Check	Approved By
2	28.06.2022	Periodic review completed. Updated with new procedure references (HSE). No changes to relevant AS's. No material changes to content	Letitia Lucke	Trent Hoare	Letitia Lucke
3	25.06.2025	Scheduled full review; refer to HSE Advice 202509A.	Jayde Smith	Carl Rothman	Kriss Ussher

14.0 Appendices

14.1 Appendix A – Types of Machinery Guards

14.1.1 Permanently Fixed Physical Barrier

A permanently fixed barrier is a physical barrier that is either welded or incorporated into the body of the machine so that it cannot be removed by the use of hand tools. It is only used for machinery in which, during normal operation, maintenance or cleaning, no person would need complete or partial access to the danger zone.

14.1.2 Securely Fixed Physical Barrier (Fixed Guard)

A 'securely fixed guard' is a physical barrier securely held in position by the use of fasteners (bolts, screws, etc) making removal without the use a tool impossible. Its primary function is to prevent access to the space enclosed by the guard however it may also be used to contain materials, tools, or liquids ejected by machinery and/or reduce emissions such as noise, dust and fumes emitted by machinery.

In reference to fixed guarding, a tool is considered to be a key or wrench designed to operate a fastener. Improvised tools such as coins or scrap metal are not considered to be a tool. Also, fasteners such as wing nuts and wedge inserts can be operated by fingers thus do not satisfy the requirements of guarding fasteners.

This type of guarding should be easy to remove and install, however it should not remain closed with the fasteners removed.

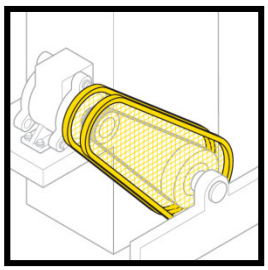


Figure 3: Illustration of a belt and pulley safeguarded through implementation of a fixed guard

Fixed guarding must only be removed once the machine is isolated, and the stored energy of the machine is released. Conversely, the machine must only be de-isolated after the guard has been repositioned in the closed position and the fasteners reinstated.

14.1.3 Distance Guard

A distance guard is a fixed physical barrier which does not completely enclose a danger zone, yet prevents access by virtue of its dimensions and the distance between the guard and hazard zone.

Any access points though the barrier, including doors and gates, must be secured with a lock or interlocking system.

14.1.4 Interlocking Physical Barriers (Control Guard)

Interlocking guards are a type of movable guard. Movable guards are physical barriers that are generally connected by mechanical means such as slides and can be opened without the use of tools. This movable physical barrier is also interconnected with the power or control system of the machine. Interconnections are usually electrical, mechanical, hydraulic or pneumatic and provide an effective safeguard where access to the hazard point is required between each machine cycles or where regular access is needed.

The interconnection prevents the machinery from operating unless the guard is closed and if the guard is opened while hazardous machine functions are operating a stop signal is given to the control system. These should not replace effective isolation. Closing the guard again will enable the operation of the hazardous machine functions however it does not automatically initiate the operation.

Interlocking guards can be differentiated into two separate groups:

- **Interlocked guard with guard locking**
  The movable physical barrier is secured by a locking device that does not allow the machine to be operated without closing and locking the guard and does not allow the opening of guard until the hazardous machine functions have ceased.

- **Interlocked guard without guard locking**
  The movable physical barrier is able to be opened at any time. The safeguarding of the system is based on the machines ability to cease the hazardous machine functions before a person or part of a person can move into danger zone.

14.1.5 Presence Sensing Equipment

Presence sensing devices do not rely on physical barriers to segregate persons from a danger zone, instead using sensing mechanisms to detect parts of the human body or persons approaching a danger zone. Once the body part or person goes beyond the predetermined limit, a signal is generated to the control system to reduce the risk to the person detected. The system relies on the machine being able to stop quickly (which may be brake assisted) to ensure that the machine stops before a person moves into a position where they could be injured.

Presence sensing equipment requires selection of a sensing mechanism appropriate for the work being done, and the correct mounting location considering speed and distance of entry and machine stopping time.

The range of sensitive protective equipment includes but is not exclusive to:
- light curtains;
- scanning devices (e.g. Laser scanners); and
- pressure sensitive mats.

These devices are far from equal in their ability to prevent or minimise the risk associated with certain types of machinery and their implementation must be in accordance with Australian Standards. These technologies are also precluded from a number of machinery applications, where there is:
- a tendency for the machinery to eject materials or component parts;
- necessity to guard against emissions (e.g. dust, radiation, noise, etc);
- erratic or excessive machine stopping time;
- inability for the machine to stop midway through the cycle;
- work areas with high levels of air borne dust (does not preclude pressure sensitive devices).

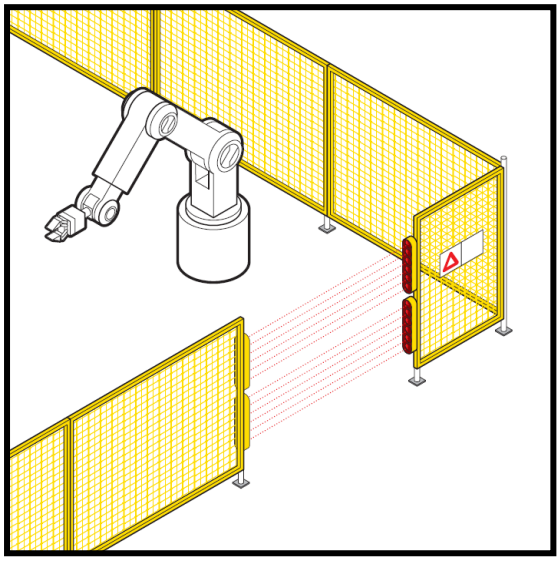


Figure 4: Presence sensing equipment

Presence sensing equipment shall be integrated into operative part and associated with the control system of the machine so that –

- A command is given as soon as the person or part of the human body is detected;
- The withdrawal of the person or part of the person detected does not, by itself, restart the hazardous machine function(s); therefore, the command given by the sensitive protective equipment shall be maintained by the control system until a new command is given;
- Restarting the hazardous machine function(s) results from the voluntary actuation, by the operator, of a control device placed outside the hazard zone, where this zone can be observed by the operator;
- While the detection function of the sensitive protective equipment is interrupted the machine cannot operate, except during muting phase (see AS 4024.1501);
- The position and the shape of the detection field prevents, possibly together with fixed guards, a person or part of a person from entering the hazard zone, from being present in it without being detected.

14.1.6 Self-Closing Guards

Self-closing guards are movable guards that are operated by a machine element, work piece or machining jig, so that it allows the work piece to pass and then automatically returns to the closed position. This returning to the closed position may be influenced by means of gravity, spring force, external power.

All plant and equipment originally fitted with self-closing guards must only be operated with the guard fitting in place, unless determined otherwise by risk assessment.

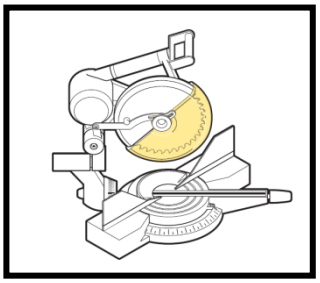


Figure 5: Self-closing guard

14.1.7 Two-Hand Control Device

Two-handed control devices require the operator of a machine to simultaneously activate the machine with both hands; this two-hand activation is required to be maintained throughout the hazardous condition cycle. Although two-handed devices can be an effective protection measure for the individual operator of the machinery, they can in some instances be easily defeated. They also do not afford protection to any other person inside or near the danger zone. Two hand control devices are frequently found in laboratories and machining workshops.

Figure 6: Two-hand control device

The design and implementation of two-hand control devices is outside the scope of this procedure. For design requirements refer to *AS 4024.2601 Design and controls, interlocks and guarding – Two-hand control devices – Functional aspects and design principles.*

14.2 Appendix B – Mechanical Hazards of Workshop Machinery

ILLUSTRATION NOTE:

Please note the below items of plant have been illustrated below without guarding to demonstrate the hazards and danger zones.

Hazard Point **Rotation/Linear Motion of Machine Parts**

14.2.1 Drawing-in or Trapping Hazards

Drawing-in and trapping hazards are created by a rotating surface and another adjacent surface which create a 'nip point'.

A nip point may be formed where;

- There are two counter-rotating parts, for example meshing gears.

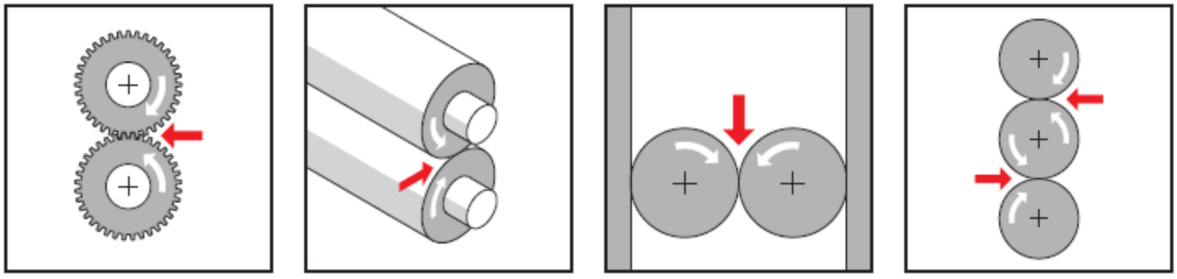


Figure 7: Examples of drawing-in hazards

- Where there is a rotating surface and tangentially moving surfaces, for example a power transmission belt and its pulley, a chain and sprocket, and a rack and pinion.

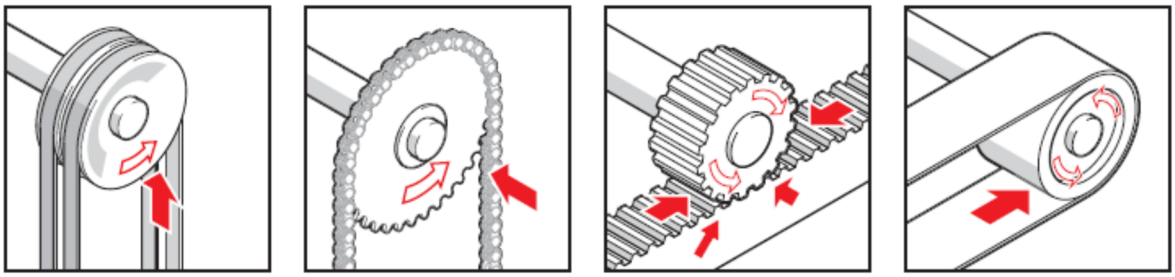


Figure 8: Examples of trapping hazards

- There are rotating and fixed parts which create a shearing, crushing or abrading action, for example flywheels and screw conveyors.

14.2.2 Entanglement Hazard

Entanglement hazards are created by a rotating piece of machinery. Injury is caused by the entanglement of body parts, or loose items of clothing, jewellery, rags or hair making contact with the rotating part, including:

- Contact with a single rotating surface, for example a smooth shaft, couplings, spindles, chucks, mandrels or rotating work pieces.

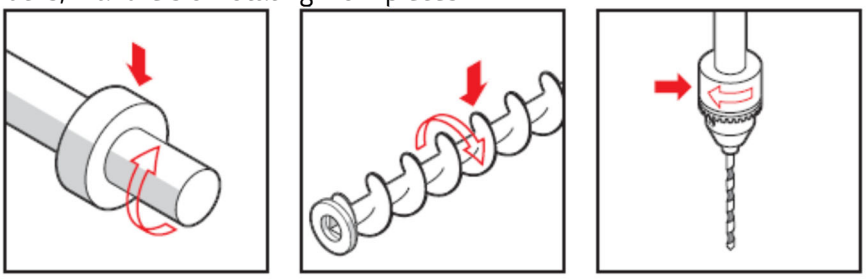


Figure 9: Examples of entanglement hazards with a single rotating surface

- Being caught on projections or in gaps, for example projection hazards such as belt fasteners and set screws, or gap related hazards such as fan blades, spoken pulleys and gear wheels.

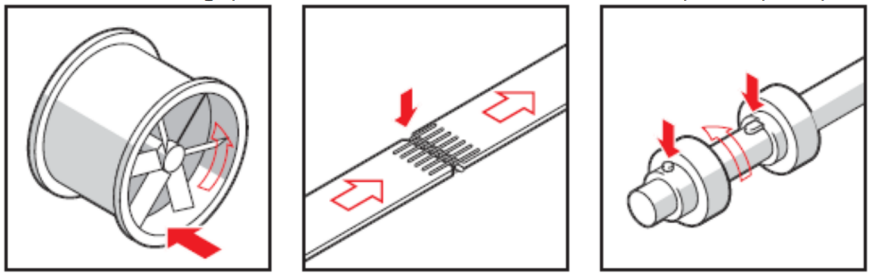


Figure 10: Examples of entanglement hazard son projections or in gaps

- Contact between rotating and fixed parts, for examples screw conveyors and their casings, the periphery and abrasive wheel and incorrectly adjusted work rest.

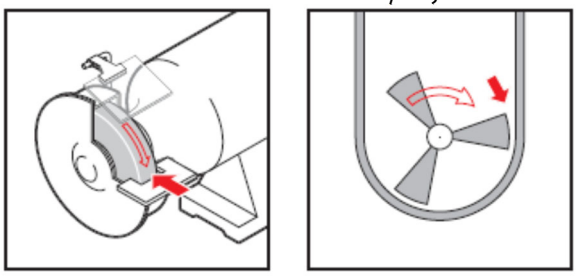


Figure 11: Examples of entanglement hazards between rotating and fixed parts

- Contact between counter rotating parts, (see Drawing-in Hazards).
- Contact between rotating and tangentially moving parts, (see Drawing-in Hazards).

14.2.3 Shearing Hazards

Shearing hazards are created by two linear moving objects with a thin geometry moving in close proximity to each other or also rotating objects adjacent to stationary object. Some examples of shearing hazards include;

- Between two machine parts, for example connecting links and rotating wheels or parts that oscillate.

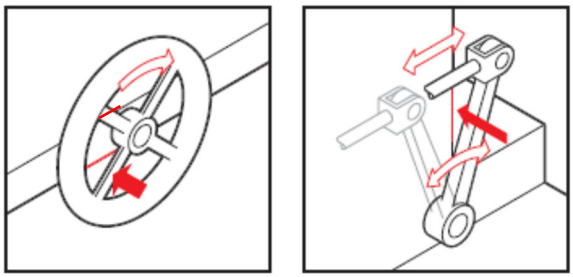


Figure 12: Examples of shearing hazards between two machine parts

- Between a machine part and work piece, for example a sampler and surrounding transfer equipment or casing.

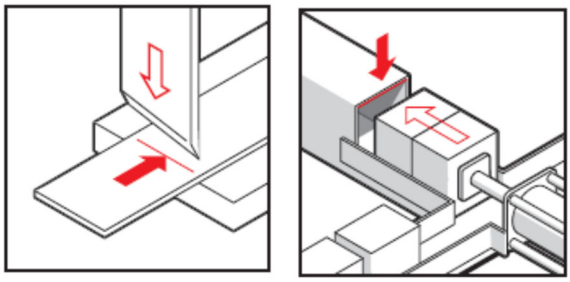


Figure 13: Examples of shearing hazards between a machine part and a work piece

14.2.4 Cutting Hazards

Cutting hazards are created at the point of operation of a cutting tool and a work piece. Cutting tools can take various forms including cutting, boring, drilling, planning, water jet cutting and laser cutting.

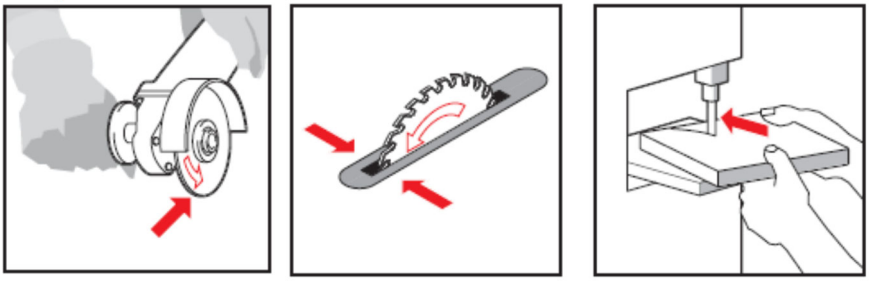


Figure 14: Examples of cutting hazards

14.2.5 Impact Hazards

Impact hazards related to plant or machinery that strikes the human body but does not penetrate. Impact hazards differ from crushing hazards in that impact hazards operate against the inertia of the body whereas crushing involves the trapping of the body between two moving parts of a moving and a stationary part.

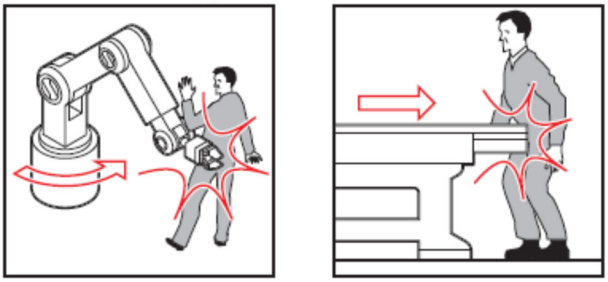


Figure 15: Examples of impact hazards

14.2.6 Stabbing and Puncturing Hazards

The human body can be penetrated by fast moving objects such as ejected debris of machine components or rapidly moving parts of machinery, for example a drill bit.

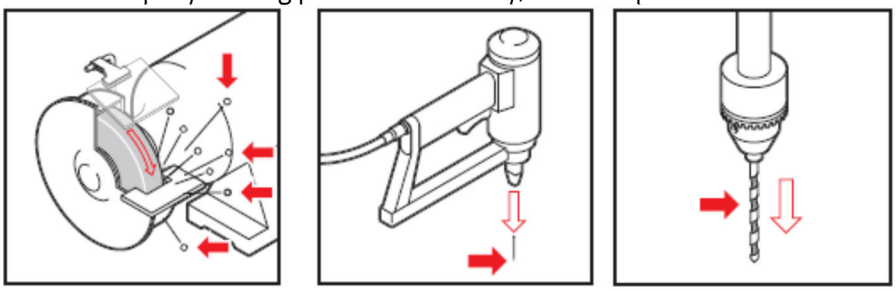
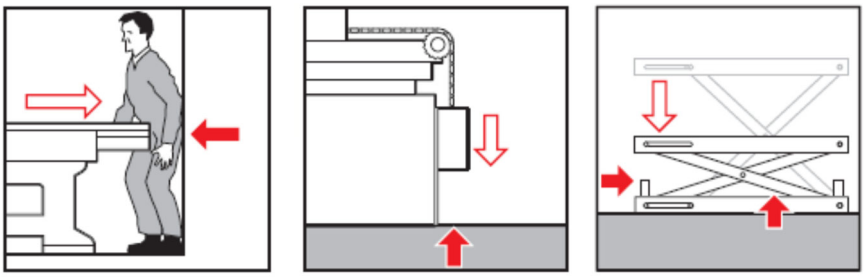


Figure 16: Examples of puncturing hazards

14.2.7 Crushing Hazards

Crushing is caused by the movement of two objects moving closer in proximity to each other, trapping part of the human body. It differs from shearing hazards as the part of the human body is not severed. Crushing occurs when the human body is trapped, either between a moving object and a stationary object or two moving objects.



MINIMUM GAP TO PREVENT CRUSHING HAZARD

AS4024.1803 establishes values for the minimum gap to prevent crushing hazards. This information can assist assessors in the identification of crushing hazards.

Figure 17: Examples of crushing hazards

14.2.8 Friction and Abrasion Hazards

Friction burns can be caused by smooth parts moving at high speed as well as rough parts, for example the wheel of a grinding machine, a conveyor belt and pulleys, and a fast moving rope or cable.

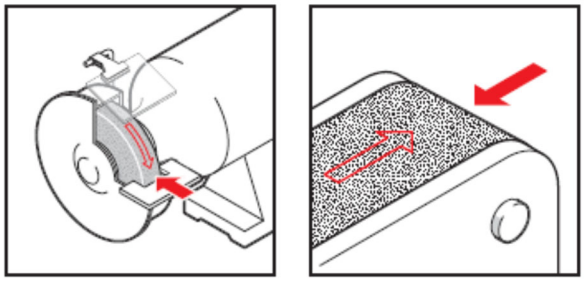


Figure 18: Examples of friction and abrasion hazards

14.2.9 Other Hazards

Additional hazards from workshop machinery that originate from energy sources other than that of mechanical hazards may be present, including:

- dust;
- explosive or flammable atmospheres;
- heat (radiation or conducted);
- high intensity light (laser, ultraviolet);
- heavy metals (lead, cadmium, mercury);
- steam;
- ionising radiation (x-rays, microwaves)
- mist (vapours or fumes);
- noise;
- ignition sources (flame or spark);
- molten metals;
- chemicals;
- pressurised fluids and gases; and
- electrical.

These hazards must be identified through the risk management process and adequate controls implemented.

14.3 Appendix C - Emergency Stop Push Buttons

An emergency stop device shall be located at each operator control station, except where the risk assessment indicates that this is not necessary, as well as at other locations, as determined by the risk assessment. It shall be positioned such that it is directly accessible and capable of non-hazardous actuation by the operator and others who could need to actuate it. Measures against inadvertent actuation should not impair its accessibility.

When determining the exact location of the emergency stop device, consider the location and the nature of the hazards identified in the risk assessment and ensure that the emergency stop device can be operated easily even if the operator is entangled by the machine (i.e. if the hazard is the entanglement of the arm of the operator, install the emergency stop device at knee height in the location where the entangled operator can actuate it).

Emergency stop push buttons shall;

- have an actuator (push button) that is coloured red, and as far as it is practicable, a yellow background;
- not have either the actuator or background labelled with text or symbols;
- be designed to avoid unintended actuation (so far as practicable, prevented by location rather than the use of other application design measures);
- generate a stop command when actuated even if the emergency stop actuator does not engage;
- be reset (e.g. unlatched) by an intentional human action, and resetting must not initiate machine start up;
- be periodically tested to ensure operational and effective.

For more information, refer to *AS/NZS 4024.1604:2019 Part 1604: Design of controls, interlocks and guarding – Emergency stop – Principles for design*.

14.4 Appendix D - Machine Inspection Tool

ANNUAL / RTS WORKSHOP MACHINE INSPECTION *Complete for each workshop machine. If any action is required, enter and manage in EARS*					
Make		**Model**		**Serial Number**	
Asset Number		**Short Description**		**Location**	
Year Manufactured		**Inspected By**		**Inspection Date**	

Item #	Criteria	Yes/No/ N/A	Is control action needed? *If yes, provide detail*	Comments / Notes
1	Records of machinery maintenance and inspections are available and subsequent maintenance/actions complete			
2	Access to the machine is restricted to authorised personnel			
3	User manual for the machine is available and in English			
4	Controls are labelled properly, in good condition and in English			
5	All machinery guards: • pose minimal interference with normal operating activities; • are of a robust construction; • do not introduce an additional hazard; • are not easy to by-pass or render non-operational			
6	Minimum PPE requirements for machine operation (other than minimum site PPE) are determined and signed at the machine			
7	Emergency stops are installed, compliant, operational and in a suitable location for operator emergency use			
8	Machine stability is achieved by inherently safe design measures or maintained by the use of protective measures e.g. anchorage bolts			
9	The location of workshop machinery is appropriate and does not introduce hazard/s			
10	Electrical cables and fixtures are undamaged			

14.5 Appendix E - Safety Review Tool

SAFETY REVIEW TOOL FOR WORKSHOP MACHINERY					
Location/ Workshop:		**Completed By:**		**Date:**	

PART A: Review Machinery Management Processes

Complete Part A for each location/ workshop. Corrective actions are to be managed in EARS

Item #	Criteria	Yes/No/ N/A	Evidence / Comments	Is control action needed? *If yes, provide detail*
1	Annual/RTS Inspections have occurred on all workshop machinery			
2	All corrective and maintenance actions arising from Annual/RTS Inspections have been completed			
3	Contemporary compliance of safety features has been established (may be achieved by engaging an external subject matter expert)			
4	Workshop Responsible Persons have been appointed by the relevant Manager/s for permanent workshops containing machinery			
5	Where required, Workshop Machine Operators have completed Area Specific Inductions			
6	Workshop Machinery Operators are compliant with minimum PPE requirements for the relevant machine being operated			
7	Housekeeping Inspections have been undertaken as required by Site			
8	Trainees, apprentices and/or new persons who undertake work using workshop machinery are aware of requirements			
9	Machinery Stay Safe documents are located in the vicinity of each workshop machine, are up-to-date and are legible			

PART B: Review Machinery Hazards

Provide the details of each machine being reviewed and answer YES, NO or N/A for each item. Duplicate Part B as required for additional machines. Corrective actions are to be managed in EARS

Item #	Criteria	Machine Details & Serial/Asset No.		
		1. Machine Details	2. Machine Details	3. Machine Details
1	**Exposure to rotating or moving parts**			
1.1	**Entanglement & Entrapment** Could hair, clothing, jewellery or other materials become entangled with moving parts of plant or materials in motion?	Yes, No, N/A	Yes, No, N/A	Yes, No, N/A
1.2	**Striking** Could anyone be struck by moving objects such as the workpiece being ejected, or by the unexpected or uncontrolled movement of the plant or workpiece?			
1.3	**Crushing & Piercing** Could anyone be crushed or pinched due to falling, uncontrolled movement of plant or its load tipping or rolling over, or contact with moving parts?			
1.4	**Shearing** Can body parts be cut off between two parts of the plant, or between a part of the plant & the workpiece or structure?			
1.5	**Cutting, Stabbing & Puncturing** Can anyone be cut, stabbed or punctured by coming into contact with moving plant or parts, or objects such as ejected workpiece or waste?			
2	**Slips, Trips & Falls** Can anyone using the plant or in the vicinity of the plant, slip, trip or fall due to the working environment or other factors?			
3	**Environmental**			
3.1	**Noise** Is it likely that the normal operation of this plant will produce excessive noise levels?			
3.2	**Dust, Fumes & Vapours** Is it likely there will be airborne dust particles, toxic fumes or volatile vapours produced & therefore be present in the workspace?			

Item #	Criteria	Machine Details & Serial/Asset No.		
		1. Machine Details	2. Machine Details	3. Machine Details
3.3	**Lighting** Is there insufficient lighting to operate this plant in a safe manner? Is there a possible strobe lighting effect caused by faulty fluorescent tubes in the workspace?			
3.4	**Temperature** Is the ambient room temperature too extreme & therefore likely to cause the operator discomfort or lack of concentration?			
4	**Electrical** Can the operator be injured by electrical shock due to working near or contact with damaged or poorly maintained live electrical conductors such as power outlets, extension leads, safety switches, starters & isolators or casual water on the floor near plant & machinery?			
5	**Hazardous Substances** Is it likely that the plant operator or others nearby in the workspace could be exposed to hazardous chemicals?			
6	**Ergonomics & Handling** Can the plant be safely operated, in a suitable location, providing clear & unobstructed access?			
7	**Explosion & Fire** Could anyone be injured by the release of stored energy triggered by volatile, explosive substances such as stored gasses, vapours or liquids? Is there potential for igniting combustible or explosive materials?			
8	**Other Hazards**			

CORRECTIVE ACTIONS / COMMENTARY
Detail any corrective actions required or commentary for Part B: