



Procedure: Fixed plant and equipment - machine guarding

Purpose

The purpose of this procedure is to define the requirements for machine guarding used to control the risk of injury arising from the use plant and equipment at the Australian National University (ANU) and to ensure compliance with [the *Work Health and Safety Act, 2011* \(Cth\)](#), [the *Work Health and Safety Regulations, 2011* \(Cth\)](#) and [the University's Work Health & Safety \(WHS\) Management System](#). This procedure will ensure that the design, construction, installation, maintenance and inspection of guarding shall be in accordance with the principles of the series of [Australian New Zealand Standards \(AS/NZS\) 4024 Safeguarding of Machinery](#). This procedure is linked to the [Australian National University's Work health and safety policy](#) and is one of the Safe Work Procedures within the WHS Management System.

Definitions

Local Area refers to a College, Research School or Service Division of the University.

Machinery Hazards, Danger Zones or Pinch-points refer to machinery, plant or equipment may present hazards to workers at all pinch points or danger zones where hands or other body parts can be caught or trapped at the in running pinch points of rotating, shearing or moving parts during normal operation.

Machinery, Plant and Equipment refers to any piece of machinery, plant or equipment which is power driven and whilst in normal operation may present hazardous moving parts to workers, their tools and objects.

A **Machine Guard** is a physical barrier that prevents or reduces access to a danger zone or pinch-point.

Procedure

Scope

1. The requirements of this procedure are applicable to all machine guarding intended to create a physical barrier for any fixed piece of plant and equipment under the control of the University as defined in the [Plant and equipment hazard management procedure](#).

Responsibilities

2. Local area's must take all reasonably practicable steps to ensure that:
- hazards are identified;
 - risk control measures are maintained and effectively monitored;
 - effective and safe systems of work are implemented and appropriately supervised; and
 - training programs support risk management principles.

Guarding of existing machinery

3. All plant and equipment shall have protection in place to prevent as far as is reasonably practicable, deliberate or accidental personal contact with moving parts, hot/cold surfaces or materials, flying objects (as a result of normal operation or failure) etc.

4. The guarding of Industrial robots and remotely energised plant shall comply with the [WHS Managing the Risks of Plant in the Workplace Code of Practice 2016](#).

5. A machine guard must provide a physical barrier that prevents or reduces access to a danger zone or pinch-point and includes the following:

- mechanical barriers (solid or open mesh);
- mechanical interlocks, where connections shall be made before the machine can be operated;
- combined mechanical/electrical interlocks, activation of which will start the machine (or in some cases reverse the direction of rotation); and
- Machines cannot be started if the interlocks are in the 'open' position.

6. Examples of such interlocks include:

- guarding of new machinery movable arm switches;
- emergency stop devices such as hand bars, or hand operated buttons;
- trip wires or electrical/optical presence sensing systems; and

- magnetic devices, which have an in built time delay.

7. All new machines and associated equipment shall be subject to a documented process of hazard identification, hazard assessment and risk control in accordance with the [National Standard for Plant \[NOHSC: 1010 \(1994\)\]](#) and Australian Standards (AS) 4024. 1201:2014 Series Safety of Machinery – Risk assessment and risk reduction.

8. The specific requirements relating to guarding in the [National Standard for Plant \[NOHSC: 1010 \(1994\)\]](#) shall be met. Where guarding is used as a control measure, a person with the responsibility for the control of risk shall ensure that any guard provided for the plant and its operation is:

- A permanently fixed physical barrier where no part of a person has access to the dangerous area during normal operation, maintenance or cleaning; or
- An interlocked physical barrier where access to dangerous areas is required during the operating sequence; or
- Where a guard in accordance with the above is not practicable, that it is a physical barrier securely fixed in position by means of fasteners or other suitable devices, which ensures that a guard cannot be altered or detached without the aid of a tool or key; then a presence sensing safeguarding system must be provided,
- A routine inspection notification will be developed to enter new guarding into the local area's guarding records for an annual inspection frequency.

Guarding of new machinery

9. All new machines and associated equipment will be subject to a documented process of hazard identification, hazard assessment and risk control in accordance with the National Standard for Plant and AS 4024.1304 Safety of Machinery – Risk Assessment.

10. The specific requirements relating to guarding in the national standard for plant (or regulations) shall be met. Where guarding is used as a control measure, a person with the responsibility for the control of risk shall ensure that any guard provided for the plant and its operation is:

- a permanently fixed physical barrier where no part of a person has access to the dangerous area during normal operation, maintenance or cleaning; or
- an interlocked physical barrier where access to dangerous areas is required during the operating sequence; or
- where a guard in accordance with the above is not practicable, that it is a physical barrier securely fixed in position by means of fasteners or other suitable devices,

which ensures that a guard cannot be altered or detached without the aid of a tool or key; then a presence sensing safeguarding system must be provided;

- If the guard is removed, it will be impossible for the machine to restart in anyway until the guard has been returned and the interlock reset; and
- a routine inspection notification will be developed to enter new guarding into the Local area's guarding records for an annual inspection frequency.

Removal of machine guards

11. Machines shall not be operated if guards or sections of guarding are missing or are not securely fixed.

12. Machine guarding shall not be removed from the equipment until the equipment has been fully isolated (all energy sources including spring tension) as per [the Isolation and danger tagging procedure](#) and all motion has ceased.

13. Machine guarding may need to be removed for maintenance or Local area requirements. The lock out procedure (isolation) and the replacement of any guards is the responsibility of the team who performs the work.

14. The Local area that normally has control over the machinery, plant and equipment in their work area will be responsible for that equipment.

15. This total possession and control of machinery, plant and equipment is then handed over to any maintenance worker who is authorised to work on the machinery, plant or equipment.

16. Once maintenance has finished the job and prior to de-isolation, all guards will be re-instated, securely fixed and inspected before handing back the equipment to the Local area. The Local area must check that all guards are in place and securely fixed before re-starting the equipment. Refer to [the Isolation and danger tagging procedure](#) for further detail.

17. In special circumstances it may be necessary to test run and make minor adjustments to equipment (tracking conveyor belts) with a section of guarding not in place. Before this activity is performed, a stand by person will be stationed by an emergency stop or isolating switch in the immediate vicinity of where the work is being performed. Additionally, supervision sign off agreeing to the controls is required on the Hazard Assessment prior to work. All other sections of guarding will be correctly installed before testing the equipment commences.

Assessment of risk for identified danger zones and pinch points

18. There are two areas of hazard assessment that need to be assessed by the local area and require guarding of the danger zones and pinch points having regard to normal operation, the associated risks and the relevant regulations:

- does a danger zone or pinch-point exist during normal operation? If so, what design of guarding is required; what is reasonable, practicable and effective for the normal operation of the machine, plant or equipment whilst providing the employee with protection against the identified danger zones or pinch-points?
- consideration needs to be given to operating machinery abnormally, such as loading and unloading material into machinery and constantly switching machinery on and off through the operational sequence. This situation presents a greater risk than normal operation.

Normal operation of machinery, plant and equipment

19. The designed operating function of the machine, plant or equipment which, when switched on and activated to run will automatically proceed with the designed work function or process.

20. This normal operation includes the employee function of switching on or off and working with, on or around the machine, plant or equipment.

21. It does not include a voluntary act of an employee defeating or making ineffective any guarding for any purpose.

Guarding and insulation of plant with hot and cold parts

22. If a worker is exposed to any hot or cold parts, the local area ensure that the exposure is monitored and is appropriately managed to minimise any risk to health or safety.

23. A thermal hazard assessment using International Standards Organisation (ISO) 13732-1 (Hot surfaces) or ISO13732-3(Cold Surfaces) shall determine the appropriate measures (Guarding/Insulating).

24. When human skin comes into contact with a hot or cold solid surface, burns may occur. e.g.:

- hot: Engines; Boiler plant; Furnaces; Transportation of molten material; Chemical reaction; Steam/molten material transfer pipework,
- cold: LPG filling station; Cylinder exchange; Compressed air.

Emergency stop controls

25. Controls shall be provided to stop the machinery in an emergency as applicable.

26. Conveyors shall be provided with manually operated, automatic lock-off manual reset type Emergency Controls. They shall be capable of being operated with minimal effort, without danger to the operator and shall be provided where the operating control is clearly visible and readily accessible at all times.

27. The location and use of the Emergency Controls will be part of the familiarisation training for new operators and supervision.

28. As a minimum, conveyor emergency stop controls shall be provided as per AS 1755. Additional emergency stop locations may be required to ensure they are readily accessible based on specific tasks or activities undertaken and the design of the installation.

Design of guarding

29. The design of guarding is to be governed by the individual function of the machine, plant or equipment, taking into account the worker job procedure, machine layout, manufacturer's requirements, the work area and any regulatory requirements.

30. Guarding is to be designed as per the risk assessed danger zones and pinch points that need to be reasonably, practicably and effectively controlled for normal operation.

31. Guarding is to be secured into position so that it cannot readily be removed without the use of tools (1/2 inch bolt and nut agreed as the standard for the University).

32. Guarding must:

- provide positive protection;
- prevent all access to the danger zones during operation;
- operate automatically or with minimum effort;
- be suitable for the job and the machine;
- resist normal wear and shock, and not easily be rendered inoperative;
- not constitute a hazard (e.g. shall be free from sharp edges or corners);
- be securely fastened to the machine or the floor, wall or ceiling and be kept in place whenever the machine is operating;
- where practicable, permit lubrication of the machine without removal of the guards; and
- If access to parts protected by guards is required for maintenance or other reasons, the guards or parts of them may be hinged or otherwise movable and wherever practicable, they shall be interlocked with the machinery.

Machine guarding records

33. A record of all machine guarding including new and modified plant and equipment is to be created and maintained for each local area by the local area and retained for the life of the plant. All obsolete guards must be removed from the records as and when they become obsolete.

34. It is a recommendation that ALL guards be painted in the same colour with Yellow or Orange preferred, however this may vary in certain cases, i.e. the need for transparent guarding.

Inspection of machine guarding

35. Pre-use Inspections:

- workers are to check attached guarding on all machinery, plant and equipment that they are to use, at the beginning of their shift or whenever they first use the equipment during a shift;
- any machinery, plant or equipment which has a guard missing, damaged or not working shall have temporary barricades placed around the unguarded area and then be reported immediately to the Local area supervisor;
- Where the situation is considered unsafe, the Supervisor shall either make the machine, plant or equipment safe or shut down the equipment in order to render it safe; and
- In either case, a full hazardous incident report form will be generated and the incident investigated to ensure appropriate action is taken and it is not repeated.

36. Annual inspections (local area):

- Each piece of machinery, plant and equipment is to be inspected for danger zones and in running pinch points annually for machine guarding;
- These inspections will review the guarding, so as to ensure that the guards are effective for normal operating conditions. The results of the inspection must be recorded in the completion notes, noting the general condition of the guarding and fixing, plus any issues that need to be actioned;
- If doubt exists as to the practicable effectiveness of any guarding (existing or in the process of design or implementation) the Work Environment Group (WEG) will assist and will be contacted in such circumstances;
- During an inspection, if a guard is not in place, damaged or missing, a hazard will be reported to the local area supervisor and via the Workplace safety incident and hazard reporting tool.

Unsafe machine guarding

37. It is the responsibility of all workers to immediately report missing or unsafe machine guarding to the Supervisor who is responsible for that work area. These deficiencies should be identified in pre-start-up checklists prior to operation.
38. Machinery shall not be operated if guards are missing, out of place or are not secured properly.
39. It will be the responsibility of the Supervisor to ensure that the machinery, plant or equipment is shut down, isolated and made safe in order to render it safe to operate.

Records

40. The responsible Local area will maintain inspection records on machine guarding and maintained in accordance with requirements of [the WHS documentation management procedure](#).
41. It is recommended that pre-start-up check lists are developed for all machinery with input from the operators and Health and Safety Representatives where possible. The completed checklists will be kept in accordance with the requirements of [the WHS documentation management procedure](#).

Training

42. It is a requirement that all workers that operate equipment with machine guarding are trained in the basic principles of machine guarding and made aware of this procedure
43. Workshop and Trade safety training, which includes Machine Guarding safety, is listed recommended for any worker operating equipment which requires machine guarding as per the [WHS training procedure](#).
44. The immediate manager or supervisor is responsible for ensuring that the training records are maintained and recorded on personnel files within the Human Resources Management System (HRMS).

Sources

Legal and other requirements
Work Health and Safety Act 2011 (Cth)
Work Health and Safety Regulations 2011 (Cth)

<u>Safe Work Australia - Managing Risks of Plant in the Workplace – Code of Practice</u>
<u>National Standard for Plant [NOHSC:1010 (1994)]</u>
ISO13732 Ergonomics of the thermal environment Methods for the assessment of human responses to contact with surfaces – <u>part 1 Hot Surfaces</u> , <u>part 2 Cold Surfaces</u>
AS 4024.1-2014 Series Safety of Machinery
AS 4024.3301-2009 Safety of machinery - Robots for industrial environments - Safety requirements
AS 4024.1501-2006 (R2014) Safety of machinery - Design of safety related parts of control systems - General principles for design
AS/NZS 4024.3611:2015 Safety of machinery - Conveyors - Belt conveyors for bulk materials handling
AS/NZS 4024.3610:2015 Safety of machinery - Conveyors - General requirements
AS/NZS 4024.1601:2014 Design of controls, interlocks and guarding - Guards - General requirements for the design and construction of fixed and movable guards

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