

PROCEDURES FOR THE ISOLATION OF MACHINERY/EQUIPMENT

May 2009

TABLE OF CONTENTS

| | |
|--|-------------------------------------|
| 1. PURPOSE | 2 |
| 2. SCOPE | 2 |
| 3. ABBREVIATIONS | 2 |
| 4. DEFINITIONS | 2 |
| 4.1 CAUTION TAG..... | 2 |
| 4.2 DANGER TAG..... | 2 |
| 4.3 EMERGENCY..... | 2 |
| 4.4 ENERGY SOURCES..... | 3 |
| 4.5 HEAD OF ACADEMIC/ADMINISTRATIVE UNIT..... | 3 |
| 4.6 ISOLATION MEASURES..... | 3 |
| 4.7 MACHINERY/EQUIPMENT..... | 3 |
| 4.8 MACHINERY/EQUIPMENT ISOLATION (LOCK OUT)..... | 3 |
| 4.9 MONASH CONTROLLED ENTITY..... | 3 |
| 4.10 RESPONSIBLE OFFICER..... | 4 |
| 4.11 SAFE WORK INSTRUCTIONS (SWI)..... | 4 |
| 5. SPECIFIC RESPONSIBILITIES | 4 |
| 5.1 HEAD OF ACADEMIC/ADMINISTRATIVE UNIT/CONTROLLED ENTITY..... | 4 |
| 5.2 SAFETY OFFICER..... | 4 |
| 5.3 LABORATORY/STUDIOP/WORKSHOP SUPERVISOR OR RESPONSIBLE OFFICER..... | 4 |
| 5.4 PERSONNEL UNDERTAKING REPAIR, SERVICE OR MAINTENANCE WORK ON MACHINERY/EQUIPMENT..... | 5 |
| 6. SAFE ISOLATION PRACTICES | 5 |
| 6.1 REQUIREMENTS FOR ISOLATION OF MACHINERY/EQUIPMENT..... | 5 |
| 6.2 SWI FOR THE ISOLATION OF MACHINERY/EQUIPMENT..... | ERROR! BOOKMARK NOT DEFINED. |
| 6.3 INFORMATION FROM SUPPLIERS, DESIGNERS, MANUFACTURERS AND IMPORTERS OF MACHINERY/EQUIPMENT..... | 5 |
| 6.4 ISOLATION OF MACHINERY/EQUIPMENT..... | 5 |
| 7. PROCEDURES FOR THE ISOLATION OF MACHINERY/EQUIPMENT | 8 |
| 8. FLOW CHART FOR THE ISOLATION OF MACHINERY/EQUIPMENT | 10 |
| 9. RECORDS | 11 |
| 10. REFERENCES | 11 |
| 10.1 LEGISLATION..... | 11 |
| 10.2 MONASH UNIVERSITY OHS DOCUMENTS..... | 11 |
| 10.3 AUSTRALIAN/NEW ZEALAND STANDARDS..... | 11 |
| 10.4 WORKSAFE DOCUMENTS..... | 11 |
| 10.5 ACKNOWLEDGEMENTS..... | 11 |
| 11. APPENDIX 1: A GUIDE TO ISOLATION DEVICES AND THEIR USE | 12 |

1. PURPOSE

The purpose of these procedures is to ensure the isolation of unsafe machinery/equipment from potential uncontrolled energy sources during repair, service or maintenance work in accordance with the requirements of the Victorian Occupational Health and Safety (Plant) Regulations 2007, Victorian Occupational Health & Safety Act 2004 and AS/NZS 4024.1:2006 *Safety of Machinery*.

The objectives of these procedures are to ensure, as far as reasonably practicable, that:

- Machinery/equipment is isolated correctly to prevent the possibility of hazards, incidents or accidents involving Monash University staff, students or contractors, property, other persons or property for which the university has a legislative responsibility.
- Students and staff at Monash University are aware of their responsibilities with regard to isolation and the reporting of unfit machinery/machinery/equipment.

2. SCOPE

This procedure applies to all staff, contractors and their employees, students and visitors and covers work carried out in all facilities including workshops, laboratories, studios and worksites at the Australian campuses of Monash University or its controlled entities. It covers any repair, service or maintenance work on machinery/machinery/equipment, which has the potential for an energy source where the individual or others may be injured from its activation.

3. ABBREVIATIONS

| | |
|------------|--------------------------------|
| OHS | Occupational health and safety |
| SWI | Safe work instructions |

4. DEFINITIONS

4.1 CAUTION TAG

A caution tag is a yellow and black tag that is used to indicate out of service machinery (see Appendix 1). The tag may be removed by appropriate service people, technical staff, or supervisor once the machinery/machinery/equipment is deemed safe for repair or for testing purposes.

4.2 DANGER TAG

A danger tag is a red and white tag that is used to protect individual personnel and machinery and may only be removed by the personnel who placed and signed the tag (see Appendix 1). This tag may only be removed when the machinery/machinery/equipment is deemed safe or the individual has completed their task. Multiple tags must be used when more than one person or group is working on an isolated energy source. In this instance one tag or isolation device is to be used on each energy source being worked on by each individual.

4.3 EMERGENCY

An emergency is an adverse situation where there is the potential for injury, threat to life or severe damage to property.

4.4 ENERGY SOURCES

An energy source is any form of energy that has the potential to damage property, injure or kill personnel. Energy sources may be in the following form: electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational, radiation, and other forms of stored or kinetic energy. Isolation is preferred both locally and at the source of the energy where practicable.

4.5 HEAD OF ACADEMIC/ADMINISTRATIVE UNIT

Head of academic/administrative unit is used to denote the head of the area that is undertaking the activity. For academic areas, this term includes head of faculty, school, department, institute or centre. For administrative areas, the term includes head of division, branch, centre or unit.

4.6 ISOLATION MEASURES

Isolation measures include locks, clasps, tags, closing and blanking devices, removal of mechanical linkages, blocks, slings, and removal from service. An appropriate measure that is high on the hierarchy of controls must be used where practicable to isolate the energy source(s).

4.7 MACHINERY/EQUIPMENT

For the purposes of this document, machinery/equipment is defined as a system or device for doing work together with a power source and any associated auxiliary equipment. This includes pressure equipment, powered equipment, hoists, powered mobile plant, lasers, turbines, explosive-powered tools, scaffolds and temporary access equipment in laboratories, studios and workshops.

For the purposes of this document machinery/equipment does not include lifts and cranes, as the processes required for these machines are covered in the document *OHS monitoring, measurement & registration at Monash University*.

4.8 MACHINERY/EQUIPMENT ISOLATION (LOCK OUT)

Machinery/equipment isolation or lock out is the isolation and safe removal of the energy source(s) from an item of machinery/machinery/equipment in such a way as to prevent the possibility of inadvertent energising of the whole or specified section of the machinery/equipment. Each energy source must be isolated and locked out at each isolation point along the energy source route where practicable. The isolation and de-energising process must also prevent the introduction of contaminants or conditions through machinery/equipment such as piping, ducts, vents, drains, conveyors, service pipes and fire protection machinery/equipment or into working areas defined as 'confined spaces'

4.9 MONASH CONTROLLED ENTITY

Monash controlled entities (eg companies) include entities where Monash can control decision making, directly or indirectly, in relation to the financial and operating policies so as to enable the entity to operate with it in pursuing the objectives of Monash University.

For the remainder of this procedure, a Monash controlled entity will be referred to as a controlled entity.

4.10 RESPONSIBLE OFFICER

The responsible officer is the staff member responsible for the machinery/equipment on a day-to-day basis.

4.11 SAFE WORK INSTRUCTIONS (SWI)

Safe work instructions are written instructions for tasks that outline the preferred method of undertaking a task whilst emphasising ways to minimise any risk(s) of harm.

5. SPECIFIC RESPONSIBILITIES

A comprehensive list of OHS responsibilities is provided in the document *OHS management at Monash University: Structure, functions, roles and responsibilities* (<http://www.adm.monash.edu.au/ohse/documents>). A summary of responsibilities with respect to isolation procedures is provided below.

5.1 HEAD OF ACADEMIC/ADMINISTRATIVE UNIT/CONTROLLED ENTITY

The head of academic/administrative unit/controlled entity must ensure that:

- this procedure is implemented and adhered to in their unit/entity;
- local safe work instructions for machinery/machinery/equipment are developed and maintained, incorporating the area of machinery/machinery/equipment isolation where necessary;
- training and support are provided to staff in carrying out this procedure;
- the operation of this procedure in their unit/entity is periodically reviewed.

5.2 SAFETY OFFICER

The safety officer must ensure that:

- risk assessments are completed for new and existing machinery/equipment, in consultation with the local health and safety representative, identifying the isolation procedures where required;
- a multiple tag isolation system is used where the isolation is to be carried out by more than one individual(s) or where tasks are undertaken by those who normally work outside of the unit/entity;
- OHS induction and training is provided for authorised persons, contractors and supervisors in local isolation procedures
- written safe work instructions, which include isolation instructions, are developed, maintained and available to staff and students.

5.3 LABORATORY/STUDIOP/WORKSHOP SUPERVISOR OR RESPONSIBLE OFFICER

The laboratory/studio/workshop supervisor or responsible officer must:

- understand the work being undertaken and isolation and tagging procedures;
- ensure that isolation is adequate and all tags and signs are prominently displayed so that staff and students are aware that the machinery/equipment is isolated and not to be operated;
- ensure that the person(s) undertaking the repair/service work are appropriately qualified to carry out the work;
- supervise the reactivation of the machinery/equipment ensuring that guarding, interlocks, and other safety devices are operating adequately;
- ensure that contractors are inducted in these procedures and their use.

5.4 PERSONNEL UNDERTAKING REPAIR, SERVICE OR MAINTENANCE WORK ON MACHINERY/EQUIPMENT

The personnel undertaking repair, service or maintenance work on machinery/equipment must:

- satisfy themselves that they understand the isolation procedures;
- be skilled, qualified trained and competent to perform the work, and in the use of any personal protective machinery/equipment required;
- adhere to the isolation instruction requirements;
- ensure the job is performed in a safe manner;
- be aware of the hazards that could exist and have the necessary controls in place
- keep the work area safe and seek immediate advice if in doubt or if circumstances or conditions change; and
- make machinery/equipment and area safe on completion of the task.

6. SAFE ISOLATION PRACTICES

6.1 REQUIREMENTS FOR ISOLATION OF MACHINERY/EQUIPMENT

- Where energy sources are present, instructions for the isolation and re-activation of machinery/equipment need to be developed for each piece of machinery/equipment as part of their safe work instructions (SWI).
- The detail of the instructions will depend upon the identification and assessment of the hazards through the risk assessment process and consequential risks involved with each piece of machinery/equipment.
- Comprehensive information regarding the risk management process at Monash is provided in the document *OHS risk management at Monash* (<http://www.adm.monash.edu.au/ohse/documents>).
- It is essential that managers and supervisors carry out this assessment and put into place control measures including machinery/equipment isolation instructions before the machinery/equipment becomes operational.
- Isolation points, which can be locked or tagged out, should be provided along the route of each potential energy source where practicable.

6.2 INFORMATION FROM SUPPLIERS, DESIGNERS, MANUFACTURERS AND IMPORTERS OF MACHINERY/EQUIPMENT

- Suppliers, designers, manufacturers and importers of the machinery/equipment have a legal obligation to supply sufficient information to enable the safe operation and maintenance of the machinery/equipment including isolation and the risks associated with the machinery/equipment during repair, service or maintenance.
- If original diagrams of plant installations are not available, new diagrams /photographs showing location and details of various plant components, isolation points, switches, valves, energy lines, pipes, power sources, and control points (including computers) should be developed as part of the SWI isolation procedures.

6.3 SWI FOR THE ISOLATION OF MACHINERY/EQUIPMENT

SWI for isolation of machinery/equipment must include:

- the situation under which the isolation procedure is to be implemented;
- the means and sequence by which the isolation will be achieved;

- the checks that are to be performed prior to the commencement of work;
- name/position of persons authorised to perform checks or issue permits (if required) related to isolation for the work location and the work to be done; and
- any other special requirements for the isolation of machinery/equipment or re-energisation.

6.4 ISOLATION OF MACHINERY/EQUIPMENT

6.4.1 Using the hierarchy of control

- When isolating or removing machinery/equipment from service, it is important to consider the hierarchy of controls in the type of isolation used.
- Engineering controls must be used in preference to administrative controls due to their increased effectiveness.
- *Appendix 1: A guide to isolation devices and their use* is provided, to demonstrate the hierarchy of control provided by each device.
- An isolation tag gives the least protection whilst isolation using a locking device and removal from service through physical relocation or the use of barricades where practicable provide a higher level of protection to the users of the area and maintenance personnel. A tag is **not** in itself an effective isolation device. A tag acts only as a means of providing information to others at the workplace and a lock should be used in preference to a tag.

6.4.2 Identification and Isolation of Energy Sources

- Ensure all electricity sources are identified and isolated, some machinery and equipment may have independent electricity sources. If programmable logic devices are used to control the equipment, then it is essential to use local isolating switches as the means to achieve secure and safe isolation. Do not rely on the controls of the programmable logic devices for the isolation of equipment, unless the device is certified as a safety PLC which isolates equipment by activating its controls.
- Except in the case of equipment connected via a plug and socket, a competent person such as an electrician should isolate and disconnect the electricity supply to an item of plant.
- Emergency stop buttons or similar stop devices on their own will not achieve full isolation. It is dangerous to rely on emergency stopping devices, as an isolation source as they cannot always be locked out and therefore may allow energy to be inadvertently re-activated. They may also allow control circuits to remain live. within the machinery or equipment.
- Take steps to remove all energy left in the plant after it has been isolated from its energy sources.
 - Inspect the plant to make sure all parts have stopped moving
 - Install ground wires
 - Relieve trapped pressure
 - Release the tension on springs, or block the movement of spring-driven parts
 - Block or brace parts that could fall because of gravity

- Block parts in hydraulic and pneumatic systems that could move from the loss of pressure
- Bleed the lines and leave vent valves open
- Drain process piping systems and close valves to prevent the flow of hazardous material
- If a line must be blocked where there is no valve, use a blank flange
- Purge reactor tanks and process lines
- Dissipate extreme cold or heat, or provide protective clothing
- If stored energy can re-accumulate, monitor it to make sure it stays below hazardous levels.

6.4.3 **Portable machinery/equipment**

- Turning off the power supply and removing the plug from the supply socket (if safe to do so) can normally isolate simple portable type machinery/equipment.
- A tag or physical restraint device can then be applied as per this procedure

6.4.4 **Multiple parties working on machinery/equipment**

- Typically the repair, service or maintenance work on a piece of machinery/equipment may involve different groups, service providers or organisations.
- The group that is responsible for the day-to-day operations of that machinery/equipment has the primary responsibility for the safety and safe operation of the machinery/equipment.
- If the repair, service or maintenance work is undertaken by another group or contractor, the laboratory/studio/workshop supervisor or responsible officer must ensure that appropriate isolation procedures are being followed and that the other group or contractor is competent in the work they are expected to carry out.
- For work involving a second party, a two-tag isolation system must be used. This involves the use of tags or locking devices for the work location and a separate tag or locking device for the group undertaking the work. In this case both parties must remove their own tags or locks on completion of the work.

6.4.5 **Removal of isolation tags or devices**

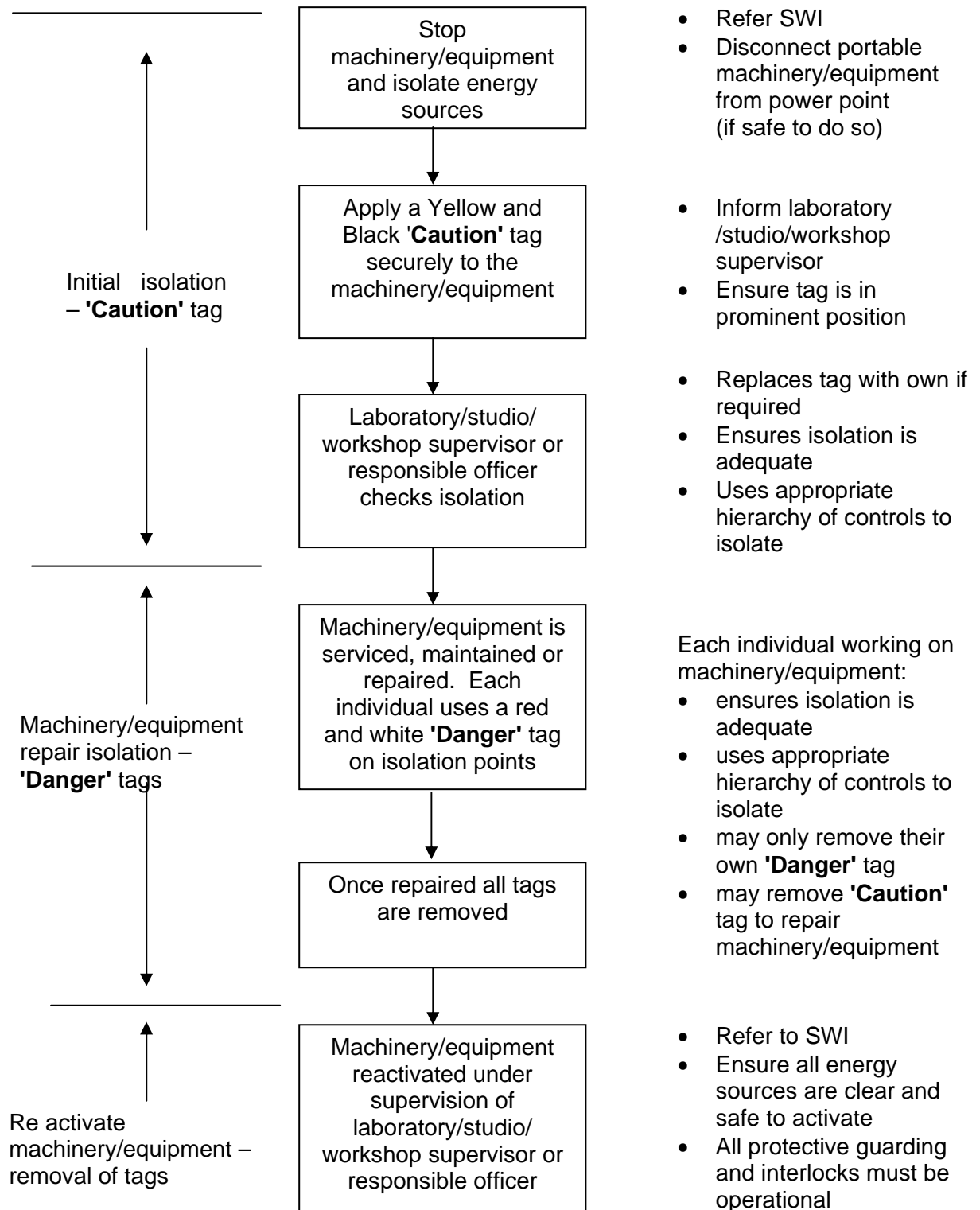
- Accidental removal of the isolation tag or device must be rectified immediately. This requires placing an isolation tag or device of your own on the machinery/equipment and the immediate notification of the removed isolation tag directly or to the laboratory/studio/workshop supervisor or responsible officer.
- The incident must be reported through the Monash University Hazard and Incident Reporting procedure.
- Isolation tags and devices are not to be used for any other purpose other than those directed in this procedure.

7. PROCEDURES FOR THE ISOLATION OF MACHINERY/EQUIPMENT

- 7.1 If safe to do so, stop machinery/equipment and isolate each energy source according to SWI or isolation documentation for the machinery/equipment.
- 7.2 A **yellow & black, 'Caution'**, isolation tag must be completed, signed and secured to each isolation device at a prominent position. The laboratory/studio/workshop supervisor or responsible officer must be notified of the machinery/equipment failure and isolation.
- 7.3 The laboratory/studio/workshop supervisor or responsible officer must check that machinery/equipment is isolated effectively and is de-energised for safe repair, service or maintenance work. Isolation locally, at points along the energy route, as well as at the energy source where practicable, is preferred.
- 7.4 **'Caution'** tags and locks may be removed by appropriate service people, technical staff, or laboratory/studio/workshop supervisor or responsible officer after consultation or once machinery/equipment is deemed safe for repair and testing purposes.
- 7.5 The laboratory/studio/workshop supervisor or responsible officer may remove original tag and re-tag out machinery/equipment with his or her own completed and signed **'Caution'** tag, if required.
- Any further isolation such as locking devices or removal from service should also take place at this time.
 - It is good practice to communicate to relevant personnel that the machinery/equipment is out of service and why.
 - The **'Caution'** tag must remain on the machinery/equipment until machinery/equipment is fully repaired and ready to be re-energized.
- 7.6 Machinery/equipment may then undergo repair, service or maintenance work by competent service providers or authorised personnel.
- These personnel must securely apply a completed and signed **white & red 'Danger'** tag and isolation device to each isolated energy source.
 - Each member of the service provider must check the isolation of the machinery/equipment and use individual tags and isolation devices on each of the isolation points along the route of the energy source.
 - A **'Danger'** tag may only be removed by the person who applied and signed the tag, unless in an emergency.

- 7.7** Personal danger tags and out of service tags must not be used together on the same item of equipment as they relate to different circumstances. An out of service tag should be removed when a personal danger tag is added, and vice versa.
- 7.8** Until all tags are removed, the machinery/equipment must remain out of service. Once removed, any tags must be destroyed and not reused.
- 7.9** Re-energising of the machinery/equipment or section must be performed according to the reactivation procedure of the machinery/equipment or under the supervision of the laboratory/studio/workshop supervisor or responsible officer, ensuring all energy sources are clear, safe to activate and that protective guarding or interlocks are operational.

8. FLOW CHART FOR THE ISOLATION OF MACHINERY/EQUIPMENT



9. RECORDS

| <u>Record to be kept by</u> | <u>Records</u> | <u>To be kept:</u> |
|--|---|---|
| Academic/administrative unit/ controlled entity | Record of isolated machinery/ equipment | Until machinery/equipment returned to service |

10. REFERENCES

10.1 LEGISLATION

Occupational Health and Safety Act 2004 (Vic)
Occupational Health and Safety (Plant) Regulations 2007 (Vic)

10.2 MONASH UNIVERSITY OHS DOCUMENTS

(<http://www.adm.monash.edu.au/ohse/documents/#policies>)

Guidelines for the development of safe work instructions
Job safety analysis
OHS management at Monash University: Structure, functions, roles and responsibilities
OHS risk management at Monash University
Risk control program

10.3 AUSTRALIAN/NEW ZEALAND STANDARDS

AS/NZS 4024.1:2000 Safety of Machinery

10.4 WORKSAFE DOCUMENTS






Guidance note: Lock out and tagging of plant (2005)
Plant (Code of Practice No.19, 1995)

10.5 ACKNOWLEDGEMENTS

The following documents were used as references in the development of these procedures:

- Deakin University lock out and tag out procedure
- Institute of Rail Technology lockout and isolation document
- BHP isolation and lockout document
- Lock out and tagging of plant (worksafe Victoria 2005)

11. APPENDIX 1: A GUIDE TO ISOLATION DEVICES AND THEIR USE

| Isolation Device | Description of use |
|--|--|
| <p>Caution tag:</p>  | <p>Yellow and black tag:</p> <ul style="list-style-type: none"> • Used for out of service machinery/equipment. • May be removed by appropriate service people, personnel, or supervisor after consultation and once machinery/equipment is deemed safe for repair and testing purposes. • May be used by any person to indicate a fault in machinery. • Tagged machinery/equipment must not be used. • Hierarchy of control level - Administrative |
| <p>Danger tag:</p>  <p><small>Comes complete with large gromet and string</small></p> | <p>Red white and black tag:</p> <ul style="list-style-type: none"> • Used to protect personnel and machinery/equipment. • May <u>only</u> be removed by the personnel who placed and signed the tag. • May be removed once machinery/equipment is deemed safe or the individual has completed their task. • Multiple tags must be used; one for each individual. • Tagged machinery/equipment must not be used. • Hierarchy of control level - Administrative |
| <p>Locking device:</p>  | <p>Isolation pad locks:</p> <ul style="list-style-type: none"> • Used to protect personnel and machinery/equipment in conjunction with tags. • May <u>only</u> be removed by the personnel who placed and signed the tag. • May be removed once machinery/equipment is deemed safe or the individual has completed their task. • Multiple locks must be used; one for each individual. • Hierarchy of control level - Engineering |
| <p>Isolation Clasps:</p>  | <p>Isolation Clasps:</p> <ul style="list-style-type: none"> • Used in conjunction with multiple locks and tags. • Each lock on a clasp represents each individual. • Hierarchy of control level - Engineering |
| <p>Physical restraint devices</p>  | <p>Physical restraint devices</p> <ul style="list-style-type: none"> • Used in conjunction with clasps locks and tags. • Use to reduce the likelihood of misuse of machinery/equipment or accidental energising. • Hierarchy of control level - Engineering |