

Policy Redesign Project

All policies and procedures are being reviewed as part of this project. This document is pending review, but remains in effect until the review is carried out.

Laser safety

Establishment: Vice-Chancellor, 5 November 2012

Last Amended: Vice-President (Strategic Finance and Resources), 10 December 2013

Nature of Amendment: In accordance with updated legislation

Date Last Reviewed: 10 December 2013

Responsible Officer: Director, Human Resources

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1. Purpose

The purpose of the laser safety procedures is to:

- protect the health of staff, students, contractors and their workers, volunteers and visitors from the hazards that can arise from laser radiation in the wavelength range 100nm to 1mm used in research at Flinders University;
- provide information to the user and ensure procedures providing adequate controls are developed;
- ensure that there is adequate warning of hazards associated with accessible radiation from laser products through signs, labels and instruction; and
- reduce the possibility of injury by minimising unnecessary accessible radiation, provide improved control of laser radiation hazards through protective features and provide safe usage of laser products by identifying user control measures.

2. Scope

These procedures apply to the use of all types of lasers used at the University.

3. Legislative and Policy framework

South Australia

Work Health and Safety Act 2012

Work Health and Safety Regulations 2012

Summary Offences Act 1953

Summary of Offences (Weapons) Regulations 2012

Approved Code of Practice for Managing the Risks of Plant in the Workplace 2012

Northern Territory

Work Health and Safety (National Uniform Legislation) Act 2011

Work Health and Safety (National Uniform Legislation) Regulations

Code of Practice for Managing the Risks of Plant in the Workplace 2012

Victoria

Occupational Health and Safety Act 2004

Occupational Health and Safety Regulations 2007

Flinders University Work Health and Safety Policy, Plant Safety Policy and WHS Risk Management Policy which apply regardless of location.

4. Standards for laser safety

Users of lasers must, at a minimum, comply with the following Australian Standards:

- AS/NZS IEC 60825.1:2011 *Safety of laser products- Equipment classification and requirements*
- AS/NZ IEC 60825.14:2011 *Safety of laser products – A user's guide*
- AS/NZS 2211.10: 2004 *Safety in Laser Products. Part 10: Application guidelines and explanatory notes to AS/NZS 2211.1 (IEC TR 60825-10:2002, MOD)*
- AS/NZ 2397:1993 *Safe use of lasers in the building and construction industry*
- AS/NZS 4173:2004 *Guide to the safe use of lasers in the Health Care industry*
- AS/NZS 2211.3:2002 : *Safety of laser products - Guidance for laser displays and shows*

Where areas do not comply with specific requirements as set out in the Australian Standards, alternative measures that provide equivalent or better protection must be adopted. The implementation of control measures not specified by the Australian Standards must be approved by the Laser Safety Officer and the WHS Unit.

5. Laser classification

Australian Standard AS/NZS IEC 60825.14:2011 sets out the classification system/rules, accessible emission limits (AELs) and maximum permissible exposure (MPE) for lasers. The class of laser should be shown on the manufacturer's label. Only lasers that are appropriately classified and labeled are to be used. Modification of any laser product as supplied by the manufacturer may change the class of that laser product.

The classification system is as follows:

Class 1 and 1M	Lasers which are incapable of damaging the eyes or skin because of either engineered design or inherently low power output (examples: CD players and barcode scanners).
Class 2	Lasers which have sufficient power output to cause damage to the eyes if viewed continuously. However their outputs are low enough to allow natural aversion responses, such as blinking, to prevent damage. Additional hazard control measures take the form of cautionary signs or labels (example: laser pointers used by conference presenters).
Class 2M	Lasers which can be hazardous if the beam is viewed directly with optical instruments.
Class 3R (Restricted)	Lasers which have the potential to cause damage to the eyes from intra-beam viewing. Precautions are required to prevent either direct viewing or viewing with optical instruments.
Class 3B	Lasers which are more hazardous because of either higher output or operation outside visible wavelengths. These are powerful enough to cause eye damage in a time shorter than the aversion response, human blink reflex or the blink reflex is by-passed due to the invisibility of the beam. In addition, specular (ie mirror-like surface) reflections may also be hazardous.
Class 4	Lasers which are high power devices capable of producing eye damage even from diffuse reflection. Skin damage is also possible even from brief exposures. Class 4 lasers may constitute a fire hazard. (Examples: surgical lasers and those used in plastic, wood and metal fabrication industries)

6. Responsibilities

Executive Deans	Executive Deans of Faculty where Class 3B or 4 lasers are used must appoint a person with appropriate knowledge to act as Laser Safety Officer (LSO), and such deputies as are necessary to ensure availability of expertise when the LSO is absent.
Deans of School	Deans of School where lasers are used are responsible for ensuring that these safety procedures are implemented in their School.

Supervisors and researchers	Responsible for laser safety in their area.
Buildings and Property Project Officers	Responsible for ensuring that use of a laser or laser product in building or construction by University staff and/or contractors at University sites or premises is in accordance with AS/NZS 2397.

7. Laser Safety Officers

Laser Safety Officers are responsible for

- assisting with laser risk management;
- reviewing Safe Work Method Statements;
- ensuring that each School or research centre which uses Class 3R, Class 3B or Class 4 lasers maintains a register of the equipment in their possession;
- identifying local laser hazard risk areas; and
- advising local areas on the appropriate safety precautions to be implemented;
- conducting regular audits on areas that have and use lasers.

Laser Safety Officers must keep a copy of AS/NZS IEC 60825.1:2011 and AS/NZS IEC 60825.14:2011 and make them available to laser users.

8. Register of lasers

Each School or research centre which uses Class 3R, Class 3B or Class 4 lasers must keep a register of the equipment in their possession, including full details of make, model, serial number, type of laser, wave length, power output (both peak power and max power used), pulse duration, classification and the designated purpose for use of each particular laser. Where a laser is used as a research tool capable of multiple uses, these should be indicated.

9. Minimum safety requirements

Australian Standard AS/NZS IEC 60825.1:2011 *Safety of laser products* gives details of control measures and associated requirements for the use of various classes of laboratory laser installations.

Equipment containing lasers must comply with Australian standards unless alternative measures are adopted that provide equivalent or better protection as set out in the relevant standard. The implementation of control measures not specified by the Australian Standards must be approved by the Laser Safety Officer and the WHS Unit. All records relating to such alternative measures, including risk assessments, must be retained.

9.1 Class 2 & 3R lasers

Precautions are required to prevent continuous viewing of the direct beam. While momentary viewing is not considered to be hazardous, Class 2 and 3R lasers should not be aimed at people. It is preferable that beams are terminated at the end of their useful path or located well above or below eye level.

Class 3R lasers should not be viewed with optical viewing aids.

9.2 Class 3B & 4 lasers

Class 3B & 4 lasers should have:

- appropriate controls to prevent unauthorized access to an area whilst lasers are in use (which may include controls such as key pad entry or remote interlock as appropriate);
- beam stop or attenuator;
- warning signs and labelling;
- beams terminated at the end of their useful path;
- beams as short as practicable, with minimum number of direction changes, and where practicable, be enclosed;
- elimination of specular reflections;
- use of eye protection where there is a potential eye hazard;
- use of protective clothing;
- medical examination of a laser user by a qualified specialist carried out immediately if there is a suspected injury;
- provision of appropriate training on safe use of equipment, including maintenance; and
- safe operating procedures for control of hazards.

Considerations for workshop and laboratory design for Class 4 lasers include:

- no windows;
- an area for storing protective eyewear;
- appropriate locks to prevent unauthorized and unprotected personnel from entering;
- a non-defeatable door interlock or equivalent measures to prevent accidental exposure during laser operation;
- signs at entrance;
- laser beam path enclosed;
- beams positively terminated;
- laser work area free of unnecessary specular surfaces;
- fire resistant curtain materials where the types of lasers in use present an ignition risk;
- a clearly visible power cut-off switch which kills power to the laser;
- a warning light located outside the laboratory/workshop door to indicate when laser is firing; and
- other controls as necessary.

9.3 Training

All users of Class 3 and 4 lasers must undertake laser safety training relevant to the work being conducted before using such lasers. Training must include, but is not limited to:

- familiarization with safe work method statements;
- the proper use of hazard control procedures;
- the need for personal protection;
- accident reporting procedures; and bioeffects of the laser on eyes and the skin.

10. Laser Risk Management

Identification of hazards and assessment of risk associated with the use of the laser must be conducted to determine if any further controls need to be implemented in addition to the minimum requirements set out in AS/NZS IEC 60825.1:2001 and AS/NZS IEC 60825.14:2011.

A risk assessment must be undertaken before a laser is first used and/or after it has been modified. The assessment must take into account at least the following:

- the capacity of the laser to injure people;

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- an evaluation of the suitability of the laser for the work;
 - the environment in which the laser is used;
 - the hazards involved and the associated risks; and
 - the level of training required for staff and students

The local Laser Safety Officer must retain a copy of the written risk assessment.

11. Labelling and warnings

Each laser must have affixed to it labels as required by Australian standards. In addition, any area where Class 3 and 4 lasers are used must have clear signage with the name of the School Laser Safety Officer and contact details including a telephone number at which he or she may be contacted.

12. Safe Work Method Statements

Safe work method statements (SWMSs) must be available in a School or research centre where Class 3 or 4 lasers are used. The statements must list the hazards associated with the particular laser(s) used, the conditions under which they can be used and the precautions necessary to ensure safety.

13. Lasers in construction or building operations

Lasers used in surveying, building or construction must be used in compliance with Australian Standard AS/NZS 2397:1993 *Safe use of lasers in the building and construction industry*. Class 3B and Class 4 lasers are not to be used in construction work.

14. Lasers in health care

The use of lasers in dental and medical practice must comply with Australian Standard AS/NZS 4173:2004 *Guide to the safe use of lasers in health care*.

15. Portable lasers and associated instruments

Portable lasers and associated instruments (eg theodolites, total stations, laser scanners, laser levels) must be risk assessed and controls implemented for each specific use and location.

16. Laser Pointers

Laser pointers with an AEL of greater than 1 milliwatt (1mW) are classed as a prohibited weapon and are not to be used other than for astronomical use.

Laser pointers with and AEL of <1mW may be used for teaching purposes.

If laser pointers of greater than 1 mW are required for research purposes , the area concerned must contact the WHS Unit prior to purchase and use of such pointers.

17. Laser Displays and Shows

The use of lasers in displays, shows and presentations must comply with AS/NZS 2211.3:2002:
Safety of laser products - Guidance for laser displays and shows

18. Review

These procedures will be reviewed at least every 4 years to ensure they remain effective, relevant and appropriate to the University, and reflect current legislative requirements.