Laser Safety

Nature of the hazard
Lasers are capable of producing intense beams of coherent radiation at optical, UV and infra-red wavelengths. While lasers vary greatly in power output, wavelength and purpose, the hazard potential of the types used for research purposes can be significant. Laser radiation can be extremely hazardous to the eyes and the skin and a number of cases of serious injury, including loss of sight, have been documented.

As a result, a number of international and Australian standards which set out requirements for laser safety have been published or revised in recent years. This guideline provides advice on the administrative measures needed to implement these standards in the university.

Laser Classification
There are three important Australian standards applicable to lasers: AS/NZS IEC 60825.14:2011 Safety of laser products, Part 14, A user’s guide and AS/NZS 4173:2004 Guide to the safe use of lasers in health care. These divide lasers into 7 classes which correlate to their hazard potential. The classes are: 1, 1M, 2, 2M, 3R, 3B, and 4. Class 1 lasers being the least hazardous and Class 4 the most hazardous. Class 1 laser products are normally safe under foreseeable conditions of use. Details of the classification system and emission limits for each class are given in the main standard (AS/NZS IEC 60825.14:2011).

Options for hazard control
Laser hazards may be controlled by the use of engineered controls, administrative controls and personal protective equipment, either singly or in combination. As a general principle engineered controls are preferred where appreciable hazards exist, although these may need in some cases to be supplemented by further administrative controls. A fully enclosed laser such as those incorporated in consumer products like CD and DVD players usually have a high degree of inherent safety and no additional safety measures are needed. A Class 4 laser that is fully enclosed can be rendered as safe as a Class 1 laser.

The lasers used in research are often high power units and while engineered safety features are required, written safe working procedures are also important - particularly in research applications where equipment configurations may need to be altered frequently. This increases the importance of the safety awareness of users because more reliance must be placed on procedural safety measures and the use of personal protective equipment.

Those responsible for laser use need to be aware that failure to implement appropriate safety standards would constitute a breach of the Queensland Workplace Health and Safety Act 2012.

In addition, Class 4 lasers used for treatment of human patients need to be compliance certified and users must be licensed under the Queensland Radiation Safety Act 1999.

Administrative control requirements
An administrative framework is needed to ensure that the procedures and conditions necessary for a safe working environment are put in place. Where lasers of class 3 and 4 are used, more detailed (and in some cases, site-specific) safe working rules and emergency procedures will need to be developed.

There are now legislative requirements for the use of class 4 lasers used for patient treatment, i.e. ophthalmologic, dental, cosmetic and general surgery. These are imposed under the Radiation Safety Act 1999 and Regulation of 2010 and require licensing for possession and use and the certification of premises and equipment. The Health Department has chosen at this time not to extend controls to lasers used outside the field of medical and cosmetic procedures although the legislation does provide for such an extension.
In the absence of specific legislative direction for research lasers the university will aim to ensure compliance with the appropriate standards by implementation of the following measures:

- The head of a school or research centre where lasers are used is responsible for ensuring that these safety guidelines are implemented.

- Each school or research centre which uses Class 3R, Class 3B or Class 4 lasers shall keep a register of the equipment in their possession. The register is to include full details of make, model, serial number, power output, classification and the designated purpose for use of each particular laser.

- The head of a school or research centre where Class 4 lasers are used shall appoint a person with appropriate knowledge to act as Laser Safety Officer. Such deputies shall also be appointed as are necessary to ensure availability of expertise, taking into account leave and other absences.

- Rooms where Class 4 lasers are used shall have a warning sign at the entrance plus door interlocks giving the name of the school or centre Laser Safety Officer and a telephone number at which they may be contacted.

- An appropriate set of safe working rules and emergency procedures (safety manual) must be available in a school or research centre where Class 3R, Class 3B or Class 4 lasers are used. The safety manual must list the hazards associated with the particular lasers used in the school or centre, the conditions under which they can be used and the precautions necessary to ensure safety. Advice can be obtained from the University Radiation Protection Adviser regarding the content of these procedures.

- Any specific requirements of the Australian Standard AS/NZS IEC 60825.14:2011 are to be complied with.

- Lasers for use in surveying, building or construction must be used in compliance with Australian Standard AS 2397-1993. As with AS/NZS IEC 60825.14:2011, a copy is to be kept by the Laser Safety Officer and made available to users.

- Lasers used in the health care professions have particular hazards unique to those applications. The use of lasers in dental and medical practice must comply with Australian Standard AS/NZS 4173:2004. This standard emphasises the need for training of laser operators and the importance of quality assurance procedures in achieving and maintaining safe working conditions in diagnostic and therapeutic applications.

- Where a Class 4 laser is used for patient treatment, a Radiation Safety and Protection Plan must also be completed and submitted to Queensland Health for approval. A Radiation Safety Officer must also be appointed in accordance with the Radiation Safety Act 1999. Persons who use Class 4 lasers for patient treatment are also required to hold a use licence issued by Queensland Health.

Contact for Additional Information

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