


Queen's University Environmental Health and Safety

Date Issued: November 18, 2004	Page No.: 1	Document No.: SOP-Radiation- 02
Revision: 1.0	Subject: Laser Safety	


Queen's University Environmental Health and Safety

	Date Issued: November 18, 2004	Page No.: 2	Document No.: SOP-Radiation- 02
	Revision: 1.0	Subject: Laser Safety	

f. Medical Surveillance

All laser workers operating or working in proximity to Class 3b or Class 4 lasers or laser systems will attend a pre-assignment and a post-assignment eye examination. Results of the examinations are maintained by the Laser Safety Officer.

Queen's University Environmental Health and Safety

	Date Issued: November 18, 2004	Page No.: 3	Document No.: SOP-Radiation- 02
	Revision: 1.0	Subject: Laser Safety	


4. Laser Safety Committee

The committee is a sub-committee of the Radiation Safety Committee. The membership includes the Laser Safety Officer and a faculty or staff member with expertise in laser technology or in the assessment of laser hazards.

Duties

1. Establish and maintain policies and standards for the control of laser hazards.
2. Recommend appropriate laser safety training program materials.
3. Maintain an awareness of applicable new or revis

Queen's University Environmental Health and Safety

	Date Issued: November 18, 2004	Page No.: 5	Document No.: SOP-Radiation- 02
	Revision: 1.0	Subject: Laser Safety	

CONTROL MEASURES


Control measures are devised to reduce the possibility of exposure of the eye or skin to hazardous levels of laser radiation. Substitution of engineering controls with administrative controls may be done with the approval of the Laser Safety Officer (LSO). The control measures below are adapted from ANSI Z136.1-1993.

Engineering controls

Although commercial laser products manufactured in compliance with the Federal Laser Product Performance Standard will be certified by the manufacturer and will incorporate some engineering controls, the use of the additional controls outlined in this section shall be considered in order to reduce the potential for hazard associated with some applications of lasers and laser systems.

Engineering Control Measures	Laser Classification					
(X = SHALL, O = SHOULD)	1	2a	2b	3a	3b	4
Protective Housing						

Queen's University Environmental Health and Safety

	Date Issued: November 18, 2004	Page No.: 8	Document No.: SOP-Radiation- 02
	Revision: 1.0	Subject: Laser Safety	

Laser Controlled Area

The following items are required for the various types of laser control area's.

Class 3b Laser Controlled Area

1. Posted with the appropriate warning sign(s)
2. Operated by qualified and authorized personnel
3. Under the direct supervision of an individual knowledgeable in laser safety
4. Located so that access to the area by spectators is limited
5. Have any potentially hazardous beam terminated in a beam stop of an appropriate material
6. Have only diffuse reflective materials in or near the beam path, where feasible
7. Have personnel within the controlled area provided with the appropriate eye protection if there is any possibility of viewing the direct or reflected beams
8. Have the laser secured such that the beam path is above or below eye level of a person in any standing or seated position, except as required for medical use.
9. Have all windows, doorways, open portals, etc. from an indoor facility be either covered or restricted in such a manner as to reduce the transmitted laser radiation to levels at or below the appropriate ocular MPE
10. Require storage or disabling (for example, removal of the key) of the laser or laser system when not in use to prevent unauthorized use.

Class 4 Laser Controlled Area

Fulfil all items of Class 3b Control areas and in addition incorporate the following.

1. Personnel who enter a Class 4 controlled area shall be adequately trained, provided with appropriate protective equipment, and follow all applicable administrative and procedural controls.
2. Class 4 area/entryway safety controls shall be designed to allow both rapid egress by laser personnel at all times and admittance to the laser controlled area under emergency conditions.
3. For emergency conditions there shall be a clearly marked "Panic Button" (remote controlled connector or equivalent device) available for deactivating the laser or reducing the output to the appropriate MPE levels.
4. Area or entryway safety controls to deactivate the laser or reduce the output to the appropriate MPE levels in the event of unexpected entry into the laser controlled area. These controls may be non-defeatable, defeatable or procedural as determined by the LSO using ANSI Z136.1-1993.

Temporary Laser Controlled Area

Where removal of panels or protective housings, over-riding of protective housing interlocks, or entry into the NHZ becomes necessary (such as for service), and the accessible laser radiation exceeds the applicable MPE, a temporary laser controlled area shall be set up. This control area shall

LASER CLASSIFICATION

All lasers are classified by the manufacturer and labeled with the appropriate warning labels. Any modification of an existing laser or an unclassified laser must be classified by the Laser Safety Officer prior to use. The following criteria are used to classify lasers:

1. **Wavelength** If the laser is designed to emit multiple wavelengths the classification is based on the most hazardous wavelength.
2. For continuous wave (CW) or repetitively pulsed lasers the **average power** output (Watts) and **limiting exposure time** inherent in the design are considered.
3. For pulsed lasers the **total energy per pulse** (Joule), **pulse duration**, **pulse repetition frequency** and **emergent beam radiant exposure** are considered.

Class 1 Lasers

These are lasers that are not hazardous for continuous viewing or are designed in such a way that prevent human access to laser radiation. These consist of low power lasers or higher power embedded lasers. (i.e. laser printers)

Class 2 Visible Lasers (400 to 700 nm)

Lasers emitting visible light which because of normal human aversion responses, do not normally present a hazard, but would if viewed directly for extended periods of time. (like many conventional light sources)

Class 2A Visible Lasers (400 to 700 nm)

Lasers emitting visible light not intended for viewing, and under normal operating conditions would not produce a injury to the eye if viewed directly for less than 1000 seconds. (i.e. bar code scanners)

Class 3a Lasers

Lasers that normally would not cause injury to the eye if viewed momentarily but would present a hazard if viewed using collecting optics (fibre optics loupe or telescope).

Class 3b Lasers

Lasers that present an eye and skin hazard if viewed directly. This includes both intrabeam viewing and specular reflections. Class 3b lasers do not produce a hazardous diffuse reflection except when viewed at close proximity.

Class 4 Lasers

Lasers that present an eye hazard from direct, specular and diffuse reflections. In addition such lasers may be fire hazards and produce skin burns.

LASER WORKER REGISTRATION FORM

The undersigned worker will participate in the Queen’s University Laser Safety Program

Laser Video

The undersigned has viewed and is familiar with the Laser Safety Video.

Laser Manual

The undersigned has read and is familiar with the contents of the Queen’s University Laser Safety Manual.

Standard Operating Procedures

The undersigned has read and is familiar with the contents of the Standard Operation Procedures for the laser(s) listed below.

Personal Protective Equipment

The undersigned has the personal protective equipment described in the SOP available to them and is familiar with their care and use.

Ophthalmic Examination

The undersigned has completed an Ophthalmic examination.

Description of Laser(s)

Location _____

Manufacturer _____ Model _____ Class _____

Manufacturer _____ Model _____ Class _____

Manufacturer _____ Model _____ Class _____

Supervisor _____ Signature _____

Worker _____ Signature _____

Date _____

Please return the completed form to:

John Bullock
 Radiation and Laser Safety Officer
 Environmental Health and Safety
 Rideau Building