**Laser Safety – Managing the Hazards**

**Compliance with this document is mandatory.**

**Feedback about this document can be sent to** seslhdexecutiveservices@sesiahs.health.nsw.gov.au

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<td>SUMMARY</td>
<td>Procedures to ensure that medical lasers are used safely</td>
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1. POLICY STATEMENT

LHD Policy Directive SESLHDPD/161 – Laser Safety states that the LHD is committed through a risk management approach, to protecting employees, contractors, students, volunteers, patients, members of the public and the environment from unnecessary exposure to laser radiation, arising from the systems and processes which use lasers within its facilities.

This document provides procedures to ensure that lasers are used safely and appropriately.

2. SIGNS

Warning signs must be placed on all entrances to a room where a laser is in use. These must include an illuminated sign that indicates when the power to the laser is on, and that the laser may be used at any time.

In addition, signs are required on the laser device itself and at all points on the laser where laser radiation is accessible.

The signs must be black on yellow background and the wording must comply with the requirements of AS/NZS 2211.1:2004. The sign must include:

(i) The international symbol for laser radiation
(ii) The laser type
(iii) The laser class
(iv) That eye protection must be worn

![Sample Laser Warning Sign](image-url)

Figure 1. A sample laser warning sign including the international symbol for laser radiation
The warning signs must be removed from all doors once the laser is no longer in use, and the key is returned.

A sign must be attached to or around each laser generating device describing what eyewear is necessary. It must use the system specified in AS/NXS 1336:1997 so that a user can check their glasses against it and thus verify they have the proper glasses selected.

3. HAZARD AREA
More correctly, the Nominal Ocular Hazard Area (NOHA) is the region around a laser where eye protection is required. Normally this is the entire room in which a laser is used, but may be less for specific lasers.

4. EYE PROTECTION
Eye protection appropriate to the laser type in use must be worn in the NOHA. It is important to note that there is no universal protective eyewear, and that staff must check that the correct protection is available (the wavelength for which the eyewear is designed is marked on the frame).

AS/NZS 1336:1997 outlines the marking system for protective eyewear. The type, wavelength, scale number, and optionally, the mechanical strength shall be marked on the eyewear.

- Type of laser is indicated by:
  - D – use with a continuous wave laser
  - I – use with a pulsed laser
  - R – use with a Q-switched laser
  - No letter – use with all types

- Wavelength of laser - wavelength regions in nanometres will be marked on the eyewear. All wavelengths that the laser produces must fall within the regions marked for the eyewear to be appropriate for use.

- The scale number is equivalent to optical density and indicates the level of protection the eyewear provides. This ranges from L1 (least protection) to L10 (maximum protection).

The protective eyewear must provide a good fit to the face, with side protection equivalent to the lenses, be resistant to mechanical damage and provide short-term protection against direct laser effects such as melting/burning of the lens.

Water and mild detergents may be used to clean the eyewear. Never use alcohol to clean them.

5. FIRE PRECAUTIONS
Many lasers have the ability to ignite flammable materials so staff must be aware of the location of a nearby fire extinguisher.
6. **ELECTRICAL HAZARD**
   High powered lasers present a significant electrical hazard and conductive fluids (such as water) should be kept away from the laser equipment. Water-based fire extinguishers should be avoided.

7. **WINDOW COVERINGS**
   Visible and near visible laser beams (effectively all except CO₂ lasers) will pass through window glass, and opaque coverings must be placed on windows when these lasers are used.

8. **REFLECTIVE MATERIALS**
   Reflections of class 4 lasers are as hazardous as the incident beam. Make sure there are no reflective materials around the operating area, particularly mirrors.

9. **KEY CONTROL**
   The key for each laser shall be kept at in a secure place when not in use, and the laser only energised by an authorised person. A laser key log book shall also be kept to record when the key was taken and returned and by whom.

10. **MAINTENANCE**
    Maintenance shall only be performed on the laser by appropriately authorised and trained persons, and these persons shall ensure that the laser is left in a safe condition following maintenance.

11. **RECORDS**
    A record of each procedure (the 'Laser Log Sheet') must be completed before and after operation of the laser. The log will be kept with the machine and be available for audit. In addition, the following records are to be maintained by the Hospital:

    - Inventory and location of laser equipment
    - Safety devices, personal protective eyewear inventory
    - Quality assurance, preventative maintenance and equipment repair reports
    - Laser safety audit reports
    - Laser training records
    - Laser incident / accident reports

12. **LASERS BROUGHT INTO THE HOSPITAL FOR TRIAL PURPOSES**
    This practice has a particular hazard, in that staff may not be aware of any special precautions of the type of laser being trialled, nor of any special protective eyewear required. The following guidelines must be followed:

    - The Laser Safety Officer must be informed of any laser being brought in on trial before the laser is delivered.
Biomedical Engineering must be similarly informed so that any necessary electrical safety testing can be performed.

Staff who will be working with the trial laser must be informed as to the features, hazards and protection required for the laser.

Medical staff who are to use a trial laser for a new application must be trained in its use, or a trained person must supervise the procedure.

13. TRAINING

SESLHD is responsible for providing training and induction of all employees who may be exposed to laser radiation in the work place. Training and induction programs must be documented. Employees and or students receiving such training and induction must have these attendances recorded.

All new staff and trainees should be made fully acquainted with the laser apparatus and ancillary devices before use. Only persons who have received training to an appropriate level should be permitted to control Class 3 or Class 4 lasers.

Training must include, but not be limited to:

- Bioeffects of the laser on the eye and the skin
- Familiarisation with the specific system operating procedures
- Proper use of hazard controls, signs, etc
- The need for personal protection and an understanding of the labelling of protective eyewear
- Accident reporting procedures

SESLHD will provide training and induction of this Procedure to all users and staff involved in laser related procedures upon commencement of employment.

14. LASER INCIDENTS AND ACCIDENTS

A laser incident is an incident adversely affecting, or likely to adversely affect, the health or safety of any person because of exposure to laser radiation.

The following procedures must be followed in the event of actual or suspected malfunction of a laser or the exposure of a person to the laser radiation.

- The user is to switch off the equipment at the main supply.
- The user is to remove the key and place a DO NOT OPERATE label on the equipment.
- The equipment must not to be used until the unit is repaired.
- The Laser Safety Supervisor is to document the incident (with photographs if possible), including details of all persons and equipment in the room.
If exposure to the eye(s) is known or suspected an ophthalmic examination should be undertaken as soon as possible.

An incident report must be submitted to IIMS by the Laser Safety Supervisor or by the staff member involved. A full investigation of the cause of the incident must be undertaken. This may require an investigation team to be established including the Laser Safety Officer.

The incident report should include:
- A full description of the incident including details of the laser involved
- Action taken;
- Proposals to prevent a recurrence.

15. DOCUMENTATION
Laser Key Control Log Sheets
Laser Procedure Log Sheets

16. AUDIT PROCESS AND QA VALIDATION
The following documentation must be maintained and audited on at least an annual basis:
- Training records of all staff who may use or be present during the use of the laser, including safety and operational training.
- Clinical credentials of all staff who will use the laser – registrars/fellows MUST be supervised by a credentialed surgeon.
- Laser procedure and laser key log sheets.
- Maintenance records of the equipment.

17. REVISION AND APPROVAL HISTORY

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<tr>
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<td>Richard Smart, Radiation Safety Officer in conjunction with the Laser Safety Officers</td>
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