Directive Information

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Authority

The National Research Council’s (NRC) Senior Executive Committee (SEC) has issued this directive and is responsible for amending it as required.

Directive Sponsor

National Research Council (NRC) President  
1200 Montreal Road, Building M-58  
Ottawa, Ontario K1A 0R6

Enquiries

Questions concerning the use of this directive and any suggestions for future amendments should be directed to your local Occupational Safety and Health (OSH) Advisor(s), who may refer such questions to:

Corporate Occupational Safety and Health (OSH) Team  
Human Resources Branch (HRB)  
1200 Montreal Road, Building M-19  
Ottawa, Ontario K1A 0R6  
(613) 993-3557
17.1 Directive Statement

17.1.1
All National Research Council (NRC) lasers and laser systems must be operated in compliance with the standard, American National Standards Institute (ANSI) Z136.1 2007, “Safe Use of Lasers,” or the most recent version.

17.1.2
This directive outlines additional health and safety requirements beyond those found in the Canada Occupational Health and Safety Regulations Part 10.26 and the National Joint Council’s (NJC) Occupational Health and Safety Directive Part 10.8.

17.2 Objective

17.2.1
The primary objective of the National Research Council’s (NRC) laser safety program is to ensure that no laser radiation in excess of the maximum permissible exposure (MPE) limit, as defined in the American National Standards Institute (ANSI) standard, reaches the human eye or skin. Additionally, the program is designed to ensure that adequate protection against collateral hazards is provided. These collateral hazards include the risk of electrical shock, fire hazard from a beam, and chemical exposures from the use of chemicals such as dyes and solvents, and vaporization of targets.

17.2.2
The National Research Council (NRC) portfolios, branches and programs (PBP) that own and/or operate lasers and laser systems will have a laser safety program in effect that complies with this directive, identifies responsibility for laser safety, and establishes a visible local responsibility centre. Specifically, those who are in control of National Research Council (NRC) workplaces will ensure compliance with the requirements of the American National Standards Institute (ANSI) standard and all other aspects of the safety program as defined in this directive.

17.3 Scope

17.3.1
This directive applies to every employee and supplementary employee of the National Research Council (NRC), non-salaried workers, and visitors granted access to any workplace owned, occupied or otherwise in the control and/or responsibility of the National Research Council (NRC).
17.4 Definitions

Committee on Occupational Safety and Health (COSH)
A legislatively mandated committee made up of management and union members working together to solve health and safety problems in their workplace.

Employee
For the purpose of this directive, an employee is a person hired by the National Research Council (NRC) on a continuing or term basis. It includes employees of other government departments reporting to or working with National Research Council (NRC) personnel. For a complete definition, refer to the Public Service Labour Relations Act.

Laser

Laser Area Personnel
National Research Council (NRC) personnel, non-salaried workers or visitors who have access to the nominal hazard zone of lasers and may or may not be laser users.

Laser Safety Officer (LSO)
A person who has the authority to monitor and enforce the control of laser hazards and effect the knowledgeable evaluation and control of laser hazards.

Maximum Permissible Exposure (MPE)
As per the American National Standards Institute (ANSI) Z136.1 2007 standard, the level of laser radiation to which an unprotected person may be exposed without adverse biological changes in the eye or skin.

Nominal Hazard Zone
The space within which the level of direct, reflected, or scattered laser radiation may exceed the maximum permissible exposure (MPE) during normal operation.

Non-Salaried Worker
The term non-salaried worker is a collective term that refers to individuals who are performing functions at the National Research Council (NRC) without receiving a salary directly from the National Research Council (NRC) (although they may receive living allowances from the National Research Council (NRC), or a salary from another employer to which the National Research Council (NRC) may or may not contribute). This includes tenants, volunteer visitors, contractors, and those positions formerly termed guest or visiting workers.

Personal Protective Equipment (PPE)
Any clothing, equipment or device worn or used by a person to protect that person from injury or illness.

Supervisor
The person at the workplace who is responsible for the employees who may be laser users.
Supplementary Employee
A person whom the National Research Council (NRC) employs:
- for a specified term of not more than three (3) months;
- on a continuing basis, to work less than one-third (1/3) of the straight time hours of a full-time employee of the same classification;
- as a student hired through the Co-op Student Program or the Student Employment Program of the National Research Council (NRC); or
- on an intermittent, irregular, hourly basis.

Visitor
A person who is on the National Research Council (NRC) premises but is not an employee, supplementary employee or a non-salaried worker.

17.5 Responsibilities

17.5.1 General Managers (GM)/Directors General (DG) shall:
- Appoint a laser safety officer (LSO). In particular, locations with class 3B or 4 lasers must have a laser safety officer (LSO);
- Provide adequate resources so the laser safety officer (LSO) can fulfill his/her mandate (Laser safety officer (LSO) training courses, educational material, manuals, laser safety meetings, etc.);
- Appoint the laser safety officer (LSO) as a member or as an observer to the local committee on occupational safety and health (COSH);
- Ensure compliance with this directive and associated laser safety guidelines and requirements within their portfolios, branches, and programs (PBP).

17.5.2 Supervisors shall:
- Ensure the implementation at the local level of this directive and the local laser safety program;
- Ensure that all laser operators for whom they are responsible are appropriately trained;
- Ensure that all laser operators for whom they are responsible follow proper laser safety procedures, including using correct personal protective equipment;
- Ensure that all accidents, incidents, or hazardous situations related to the use of lasers within their area of responsibility are investigated and reported to the local laser safety officer (LSO) and committee on occupational safety and health (COSH).

17.5.3 Committees on occupational safety and health (COSH) shall:
- Work with the laser safety officer (LSO) to verify that the requirements of this directive and the American National Standards Institute (ANSI) Standard are met.
The laser safety officers (LSOs) will be observers or active members on local committees on occupational safety and health (COSH).

17.5.4

**Laser Safety Officers (LSO)**

The role of the laser safety officer (LSO) is to work with the laser technicians, operators, researchers, supervisors and management to help provide a safe environment for employees, clients and all personnel that will enter within the nominal hazard zone of laser systems.

Below are specific tasks of the laser safety officer (LSO) as presented in Appendix A of the American National Standards Institute (ANSI) Standard. (Laser safety officers (LSOs) are advised to obtain a copy of the standard directly from American National Standards Institute (ANSI)).

- Classify or verify classification of lasers and laser systems;
- Evaluate laser work areas, including establishing nominal hazard zones;
- Verify that the prescribed control measures are in effect, recommending or approving substitutes or alternate control measures;
- Approve standard operating procedures (SOPs), alignment procedures and other procedures;
- Jointly develop standard operating procedures (SOPs) with laser operators and their supervisors;
- Recommend or approve personal protective equipment (PPE);
- Approve the wording on area signs and equipment;
- Approve laser installation facilities and laser equipment prior to use and modifications;
- Verify that the safety features of the laser installation facilities and laser equipment are audited periodically to assure proper operation;
- Verify that adequate safety education and training is provided to laser area personnel;
- Determine the personnel categories for medical surveillance;
- Administer the overall laser safety program;
- Maintain a current inventory of lasers;
- Update the local laser safety manual;
- Participate in the investigation of laser-related accidents and near misses.

17.5.5

**Laser Operators shall:**

- Use lasers safely;
- Read, understand and apply the laser’s safety manual and standard operating procedures (SOPs) (may also participate in developing standard operating procedures (SOPs) with the laser safety officer (LSO));
- Follow standard operating procedures (SOPs) for operations, maintenance, servicing and demonstrations;
- Wear all required personal protective equipment (PPE);
• Ensure they have proper training and authorization of their supervisor before operating laser systems;
• Promptly report to their supervisor and the laser safety officer (LSO) any injury or incident involving a near-miss that could have caused an injury, or any malfunction, problems, etc., that may have an impact on safety;
• Inform their supervisor and the laser safety officer (LSO) of any people not following the standard operating procedures (SOPs);
• Maintain the labs in a state that is clean and safe.

17.5.6

Local Occupational Safety and Health Advisors shall:
Assist the laser safety officer (LSO) in ensuring compliance with the American National Standards Institute (ANSI) Standard.

17.5.7

National Research Council (NRC) Corporate Occupational Safety and Health (OSH) Team shall:
• Assist the local laser safety officers (LSOs) and Occupational Safety and Health (OSH) Advisors in ensuring compliance with the American National Standards Institute (ANSI) Standard;
• Review this directive at least every five years;
• Provide or arrange laser safety training, as needed.

17.6 Laser Safety Guidelines and Requirements

17.6.1
The following are general laser safety guidelines and requirements. For more detailed laser safety information and recommendations, refer to the American National Standards Institute (ANSI) Z136.1-2007 standard or the most recent version.

17.6.2

General Laser Safety

All portfolios, branches and programs (PBP) with class 3B or 4 lasers and/or laser systems must have a laser safety officer (LSO) and a laser safety training manual, which includes general safety procedures and guidelines. Some basic safety procedures that should be respected when working with lasers are the following:

- Wear appropriate safety goggles for the laser wavelength and intensity (recommended for most higher-power lasers, but required for Class 4 lasers);
- Minimize the number of reflective surfaces in the room (other than the optical components on the bench) or on yourself, especially at beam level;
- Make sure that all windows in the room are made opaque or blacked out;
- For high-power lasers, install warning lights outside the room and/or door interlocks where practical;
- Align optics at low laser power;
- Avoid positioning eyes at beam level.
17.6.3

**Laser Safety Training Manual**

This manual should include safety information more specific to the local lasers and laser systems, such as:

- Training topics for laser operators, including the following:
  - Laser fundamentals
  - Bioeffects on eyes and skin
  - Specular vs. diffuse reflection
  - Non-beam hazards
  - Classifications
  - Control measures
  - Responsibilities
- General safety standards for the different laser classes;
- Labeling and signage requirements for each laser or laser type;
- Waste disposal procedures for lasers and laser components;
- Identification of the need for health monitoring;
- Emergency measures.

17.6.4

**Specific Laser Safety Manuals**

All lasers or laser systems of Class 3B should, and Class 4 must, have their own specific safety manual conveniently located near the instrument, and should include:

- Identification of hazards, including non-beam hazards;
- Administrative and procedural controls;
- Standard operating procedures (SOPs);
- Appropriate protective eyewear and other personal protective equipment (PPE) for the specific laser or laser system;
- Other protective requirements (curtains, windows, barriers, gloves, etc.).

17.6.5

**Laser Safety Officer Training**

In addition to the topics covered in the training for laser operators outlined above, laser safety officers (LSOs) should have training on the following:

- Terminology
- Types of lasers and characteristics
- Radiometric units and measuring devices
- Maximum permissible exposure (MPE) level for eyes and skin
- Laser hazard evaluations, range equations and other calculations
17.7 Background Sources

- *Canada Labour Code*, Part II
- Canada Occupational Health and Safety Regulations, Section 10.26, Ionizing and Non-ionizing Radiation
- National Joint Council’s Occupational Health and Safety Directive, Section 11.7, Ionizing and Non-ionizing Radiation