



# STANDARD OPERATING PROCEDURE (SOP) TEMPLATE FOR CLASS 3B and/or CLASS 4 LASER USE

Principal investigator/Supervisor	Date
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This is a customizable SOP template that individual lab or research groups may use to document their lab-specific guidelines.

## 1. REVISION HISTORY

<i>Revision Date</i>	<i>Author</i>	<i>Position</i>
1. DD-MM-YYYY	Author's name	e.g. Research assistant / PhD candidate / PI

## 2. DOCUMENT APPROVAL

*Approved by:* Document was approved by (e.g. Dept. Chair / Supervisor)

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*Approval Signature* *Date Approved*

### INSTRUCTIONS

Remember that an SOP simply documents steps taken every day to perform a task (and does not have to be fancy). It should be accurate, easy to access, and contain locations for additional information, if needed.

Replace or remove text in grey italics (if replaced, change font colour to black). The grey text explains the rationale or content for populating the SOP. Delete this introduction as well.

This guideline is organized to start with the daily, normal operating procedures followed by emergency procedures. This organization allows for these two pages to be copied and attached to the lasers, if necessary, to provide laboratory personnel a handy guide. Addition of pictures are encouraged

Ensure the latest procedures are always posted by using the Revision History above.

### 3. PURPOSE

*State the purpose of the Standard Operating Procedure – include name, model &, serial # class of the laser system.*

### 4. TRAINING

All laser workers including faculty, staff, students and volunteers are required to:

- complete the SFU Laser Safety Orientation;
- complete on-the-job training in the safe operation of the specific laser system that he/she will operate;
- understand all applicable safety rules, codes and emergency procedures laid out in the SFU Laser Safety Manual;
- understand the contents of this Standard Operating Procedures (SOPs) for the specific laser system that will be operated; and
- be authorized by the responsible user/owner.

### 5. POLICY

A laser safety program is in place at SFU and is administered by the University Radiation Safety Committee (URSC) and the Laser Safety Officer (LSO). The purpose of such a program is to monitor teaching and research facility design, procedures, equipment, and to implement and enforce the policies, regulations and procedures for the control and safe use of lasers and laser systems.

The SFU Laser Safety Program, SFU's Radiation Safety Policy (R 20.05) and the [SFU Laser Safety Manual](#) have been developed in compliance with WorkSafeBC's Occupational Health and Safety Regulation, the American National Standard for Safe Use of Lasers (ANSI Z136.1), and all related regulations and standards. The ANSI Z136.1 standards are the foundation of evaluating laser-related occupational safety.

### 6. ROLES AND RESPONSIBILITIES

*Provide a description of the responsibilities for all personnel working with or around the laser, and how individuals will be trained on their responsibilities.*

6.1 Responsibilities of the principal investigator, {insert professor's name}, include:

- Register all class 3B or class 4 lasers or laser systems with EHS.
- Identify all class 3B and class 4 laser supervisors and workers under his/her authority to the LSO by completing the Authorized Laser User Form and posting in a prominent place near the laser.
- Provide each laser supervisor/worker training in the safe operation of the specific laser system that he/she will operate.
- Ensure that laser supervisors/workers have completed SFU EHS Laser Safety training prior to working with or in proximity of class 3B or class 4 lasers or laser systems. If this is not

possible, provide (either personally or through a laser supervisor) appropriate instruction and supervision until training is available. Only trained and authorized laser supervisors/workers are permitted to operate or work in proximity of class 3B or class 4 lasers or laser systems.

- Ensure that all engineering controls are in place and all administrative procedure controls are followed.
- Provide and enforce the use of appropriate personal protective equipment when required.
- Provide these written standard operating procedures (SOPs) and alignment/maintenance procedures for all class 3B and class 4 laser/laser systems and to ensure that each laser is used only under conditions and in locations which meet the requirements of the SOP(s). These SOPs are to be posted in a visible area in the laser working area.
- Not permit the operation of a laser unless there is adequate control of laser hazards to employees, visitors, and the general public.
- Not permit operation of a new or modified class 3B or class 4 laser or laser system under his/her authority without the approval of the LSO. Submit plans for new class 3B or class 4 laser installations or modifications to the LSO for approval.
- Ensure that all class 3B or class 4 lasers or laser systems are securely stored or disabled (for example by removal of the key) when not operating and to prevent unauthorized use.
- Ensure that all laser workers and supervisors participate in SFU's medical surveillance program.
- Ensure that any spectators are properly informed and protected from potential hazards.
- Participate with the LSO during laser safety inspections and correct any unsafe conditions in a timely manner.
- Report any actual or suspected accidents or incidents to EHS. If necessary, assist in obtaining appropriate medical attention for any person involved in a laser accident.
- Instruct workers to report all incidents and accidents to their supervisor and EHS and to seek medical attention within two hours of an exposure (or suspected exposure).
- Maintain records of training.

#### 6.2 Responsibilities of all laser workers include:

- Successfully complete SFU's laser safety training and receive on-the-job training before operating or working in proximity to Class 3b and 4 laser or laser systems
- Participate in SFU's medical surveillance program
- Report all unsafe conditions to the laser supervisor and the laser safety officer
- Understand the contents of this Standard Operating Procedures (SOPs) for the specific laser system that will be operated

*List responsibilities*



### 7. DEFINITIONS

ANSI – American National Standards Institute

SOP – Safe Operating Procedure

LEP – Laser Eye Protection

OD – Optical Density

*List additional abbreviations*

### 8. LASER SYSTEM CHARACTERISTICS

*List the various lasers & laser systems this SOP applies to; duplicate the table below per laser*

<b>Laser Type:</b>	<i>Pulsed or continuous wave</i>	<b>Lasng Medium:</b>	<i>e.g. Ar ion, diode, etc</i>
<b>Wavelength:</b>	<i>Enter ranges (nm); visible or invisible?</i>	<b>Power:</b>	<i>CW: max power; pulsed: average power or max energy per pulse</i>
<b>Rep. Rate:</b>	<i>Maximum if pulsed, else CW</i>	<b>Beam Divergence</b>	<i>Enter 1/e<sup>2</sup> at laser aperture (mrad)</i>
<b>Pulse width:</b>	<i>Enter operating value, if applicable</i>	<b>Beam Diameter:</b>	<i>Enter 1/e at laser aperture (mm)</i>
<b>Required Goggle OD:</b>	<i>List ODs for all wavelengths (ex: 532 nm: 5+; 800 nm: 7+) – model number, if applicable</i>		
<b>Storage Location:</b>	<i>Indicate where these goggles can be found</i>		
<b>Additional PPE:</b>	<i>If applicable</i>		

### 9. LASER CONTROLLED AREA

*Any work with the laser must be performed in a laser controlled area with signage to alert others that the laser is in use in that area. Provide a description of the designated area, i.e. building and room number, location in room, where signage is located etc.*

### 10. CONTROL MEASURES FOR LASER CONTROLLED AREA

*The purpose of this section is to identify all control measures to be followed for the applicable Class 3B and Class 4 laser(s) used. Control measures are devised to reduce the possibility of exposure of the eye or skin to hazardous levels of laser radiation. Include all implemented engineering (e.g. laser curtains etc) and administrative safety controls (e.g. warning lights etc), and all required personal protective equipment (e.g. laser eye protection). Please refer to Section 8 of the [SFU Laser Safety Manual](#) for a complete list of required control measures.*



## **11. LASER OPERATION PROCEDURE**

*Standard start-up sequence of the laser usually comes from the manufacturer with additional comments that may pertain to the specific implementation of the system in the lab and/or in conjunction with the experimental protocol. If you keep a lab book that tracks the daily operation of the laser, and the procedure is written permanently there, you can indicate that here. Include safety control measures that must be in place prior to operating the laser (e.g. closing curtains, blocking windows, wearing laser protection glasses)*

### **11.1 Start-up Procedure**

- a. Step 1
- b. Step 2

### **11.2 Shutdown procedure**

## **12. LASER ALIGNMENT PROCEDURE**

*These steps should indicate how to align this laser to an experiment. For example, using a different low power laser, or how to set the current laser to a lower power and indicate that power setting here. If the laser is set up for one particular experiment, for example to a microscope, these steps may be about verifying that the laser is well-aligned. For general setups, you may have cameras, specific beam viewing cards, or apertures that need to be verified before proceeding.*

*Laser beam alignment is a laser repair/internal optimization activity. Usually this procedure changes the wavelength conditions listed on the Danger sign of the laboratory door because other embedded lasers are exposed. If the conditions in the laboratory change, a Notice sign is required indicating those changes and that only authorized personnel are allowed to enter the lab: it is unlikely that sufficient PPE for everyone in the lab under these conditions are available, so this sign indicates restricted access.*

*If only particular personnel are permitted to align laser, list their names*

*Safety interlocks shall not be permanently disabled without the consent of the Laser Safety Officer.*

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**Required Goggle OD:** *List ODs for all wavelengths (ex: 532 nm: 5+; 800 nm: 7+)*

**Storage Location:** *Indicate where these goggles can be found*

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### **13. LASER MAINTENANCE**

*These steps should be followed, including by external service providers (remove if not applicable). An ANSI NOTICE sign must be posted during the maintenance procedure.*

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<b>Required Goggle OD:</b>	<i>List ODs for all wavelengths (ex: 532 nm: 5+; 800 nm: 7+)</i>
<b>Storage Location:</b>	<i>Indicate where these goggles can be found</i>

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### **14. LASER EMERGENCY PROCEDURES**

*The purpose of the emergency procedure is to determine if the laser can be safely contained or safely shutdown without damaging the equipment in an emergency situation. The procedure could be a single step, such as engaging an emergency stop button. If a lengthy shutdown procedure is required, a procedure is needed, or protocol documented, to ensure that the beam is safely contained and will not present a further hazard during the emergency or to emergency response personnel that may need to access the laboratory.*

*All efforts should be made to set up a single step safe shutdown of the system so that laser operators can rapidly exit the area while ensuring that the laser hazard is minimized or non-existent.*

### **15. INCIDENT OR SUSPECTED INCIDENT PROCEDURES**

*Outline the steps that will be taken in the event there is an incident or suspected incident involving the laser. Please refer to Appendix C of the [SFU Laser Safety Manual](#) for procedures following a suspected or actual laser-induced injury.*



### 16. TRAINING SIGN OFF

After completion of required training, laser workers shall read and fully adhere to this SOP before working with Class 3B or Class 4 lasers. Laser workers shall document that they have read it and are trained in the procedure by signing and dating a training record below. The PI or Responsible Person will counter sign that they acknowledge that the individual has received the training and they are confident in their knowledge and ability to adhere safely to the SOP.

First name	Last Name	Date	Signature Incumbent	Signature PI / Responsible Person