Laser Safety Program

Standard Operating Procedures

Date: 02/25/19

Lab Director (LD) Approval is Required Prior to Performing this Procedure

This document serves as a template for laboratories using lasers as part of their research protocol. It is not a complete document. The steps in the procedures are provided to help you get started writing standard operating procedures (SOPs) for your lab. Therefore, you will be required to complete the following tasks to insure your lab meets all University of Michigan policies for safety and for the environment:

* Determine which SOPs are applicable to your lab and research process.
* Supply the information requested (indicated by opening and closing “<>” and in all caps), where the information is relevant to the SOP.
* Insert additional procedures, steps, and information to reflect the procedure in your lab.
* Write SOPs for any procedure not accounted for in this document.
* Include the final draft of the SOPs in the Chemical Hygiene Plan, Laser Safety section.

When writing the Laser Safety SOP refer to the [[Laser Safety Program Guideline](https://ehs.umich.edu/wp-content/uploads/2016/02/LaserSafety.pdf)](https://ehs.umich.edu/research-clinical/lasers/). This document contains information and tables compiled from ANSI Z136.1-2014, Safe Use of Lasers.

Completing these steps will help ensure that you have written the necessary SOPs that are specific to your lab, that are in compliance with University of Michigan [Academic Laboratory and Research Safety Policy](https://ehs.umich.edu/wp-content/uploads/2016/10/Academic_Lab_Research_Safety_Policy.pdf) and the per ANSI Z136.1-2014, and that help prevent or reduce the likelihood of an accident or exposure in your lab. For assistance with writing the SOP, contact the Environment, Health & Safety (EHS) Laser Safety Officer.

# Location

Indicate <THE ROOM(S)/BUILDING(S)> in which this procedure is performed.

NOTE: If this process is to be run in a specific location in the lab, be explicit.

# Equipment

It is required to document a complete inventory of all lasers used under this SOP. For each laser, list the following information for each laser in a list or table format:

* <Building>
* <Room>
* <LD>
* <Laser SAFETY Supervisor (see the [Laser Safety Program Guideline](https://ehs.umich.edu/wp-content/uploads/2016/02/LaserSafety.pdf), p.18)>
* <Manufacturer>
* <Model>
* <Serial number>
* <Date of manufacture>
* <Power (W); if pulsed, Energy (J) with pulse duration and repetition rate (Hz)>
* <Class>
* <Wavelength>
* <Beam diameter (mm)>
* <Beam divergence (mrad)>

# Potential Hazards

<List all hazards for the lasers and/or laser systems used under this SOP> such as unenclosed beams, invisible beams, scatter potential, hazardous materials (dyes/solvents), compressed gases, fumes, electrical hazards, laser generated air contaminants, noise, etc.

# Engineering Controls

<State the control measures to be used for each hazard listed in the previous section>. Examples include the following:

* Protective housing
* Interlocks on removable protective housings
* Service access panel
* Key control
* Viewing windows
* Enclosed beam path
* Area warning signs and devices
* Entryway controls
* Protective barriers and curtains

# Work Practice Controls

<Describe work practices to be used that reduce risk to exposure to laser radiation.> <Outline your alignment procedures here.>

NOTE: In this section, EHS provides a list of guidelines for you to include, as applicable, in your laser safety standard operating procedures.

Alignments must be done only by those who have received laser safety training and appropriate on-the-job training and are aware of any non-beam hazards that may arise.

## Co-Worker Protection

* Exclude unnecessary personnel from the laser area during alignment and only allow trained employees to be present.
* Notify everyone in the lab that you are doing a beam alignment.
* Post additional warning signs on doors and entrances to the lab, as appropriate.
* Communicate with everyone that an alignment is being performed. All personnel must wear laser eyewear in the Nominal Hazard Zone (NHZ).

## Personal Protection

* Review all alignment procedures before attempting the alignment.
* Whenever possible, use remote viewing devices and automated devices.
* Remove watches, jewelry, objects in shirt pockets, and tape over or remove rings so they do not reflect a beam.
* Wear protective laser eyewear at all times during the alignment.
* Wear a lab coat or a long-sleeved shirt to protect skin from UV lasers.
* Do not look directly into the beam!

## Preparing the Lab Prior to Aligning the Laser

* Be sure the work area and optical table are free of objects or surfaces that could reflect light.
* Make sure that any reflective surfaces in the area are covered.
* Make sure all warning signs are in place and that the lights and locks are operating.

## Preparing the Laser

* Whenever possible, use a low-power (Class 2 or Class 3R) visible laser for path simulation of higher-power visible or invisible light lasers. If not, operate laser at lowest power setting possible for alignment.
* Ensure the Class 3B and Class 4 lasers cannot be energized inadvertently. Implement the [Lockout/Tagout – Control of Hazardous Energy Sources Guideline](https://ehs.umich.edu/wp-content/uploads/2016/08/loto_guideline.pdf).

## Planning the Laser Path

Make sure the resulting beam paths will be at a safe height (not at eye level when sitting or standing).

## Beam Control Measures

* Enclose the beam as much as possible.
* Use image converters, phosphor cards, or IR cards to locate beams.
* Use a shutter or beam block to block high-power beams at their source except when they are actually needed during the alignment process.
* Use a beam block to terminate high-power down range of the optics being aligned.
* Use beam blocks, laser protective barriers (curtains and shields), or both in conditions where alignment beams could stray into areas with uninvolved personnel.
* Place beam blocks behind optics to terminate beams that might miss mirrors during alignment.
* Locate and block all specular reflections before proceeding to the next optical component or section using IR cards or laser alignment eyewear.

## After the Alignment Process

* Whenever possible, use remote viewing devices and automated devices.
* Be sure all beams and reflections are properly terminated prior to high power operation.
* Replace any enclosures of beam stops removed as part of the alignment process.
* Communicate with everyone in the lab at all times (especially before removing eyewear).

# Personal Protective Equipment (PPE)

<Specify type of eye protection used> (include Manufacturer, wavelength attenuated, Optical Density (OD), storage location, etc.)

<Specify clothing required to protect from skin hazards>.

# Exposures/Unintended Contact



**IF THE EMPLOYEE IS NEED OF EMERGENCY MEDICAL ATTENTION, CALL 911 IMMEDIATELY!**

<Describe what actions to take in case of an accidental exposure to laser radiation.>

<Describe procedures to contact Occupational Health Services for medical advice on occupational exposures and completing the work-related injury and illness form.>

Contact EH&S for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

Report all work related accidents, injuries, illnesses or exposures to Work Connections within 24 hours by completing and submitting the [Illness and Injury Report Form](http://www.workconnections.umich.edu/employees/work-related-illness-injury/step-one/). Follow the directions on the Work Connections website [Where to go for treatment](http://www.workconnections.umich.edu/treatment.html) to obtain proper medical treatment and follow-up.

Incidents relating to research must also be reported to EHS.  Complete the [Laboratory Incident and Near Miss Report Form](http://ehs.umich.edu/forms/laboratory-incident-and-near-miss-report/) for research-related incidents involving:

* Near misses
* Fires/Explosions
* Property damage
* Injuries
* Illnesses

# Treatment Facilities

* U-M Occupational Health Services -- Campus Employees  
  Mon-Fri 7:30 am - 4:30 pm  
  After hours - go to UM Hospital Emergency Dept. – Urgent Care Clinic  
  C380 Med Inn building  
  1500 East Medical Center Drive, Ann Arbor (734) 764-8021
* University Health Services -- University students (non-life threatening conditions)  
  Mon-Fri 8 am – 4:30 pm, Sat 9 am – 12 pm  
  Contact for current hours as they may vary  
  207 Fletcher Street, Ann Arbor (734) 764-8320
* UMHS Emergency Department -- after clinic hours or on weekends  
  1500 East Medical Center Drive, Ann Arbor, (734) 936-6666

# Training

All personnel using Class 3B and Class 4 lasers are required, at a minimum, to complete EH&S’s online Laser Safety Training through My LINC (Course EHS BLS005w).

The lab director or laser safety supervisor in each lab must give on-the-job training to all employees working with Class 3B and Class 4 lasers.

Training records must be documented for record keeping purposes. These records may be kept in the Laser Safety Section the Blue Binder.

# Related Documents

* [Lockout/Tagout – Control of Hazardous Energy Sources](http://ehs.umich.edu/wp-content/uploads/2016/08/loto_guideline.pdf)
* [Laser Safety Program Laboratory Audit Form](https://ehs.umich.edu/wp-content/uploads/2023/06/Audit-checklist-Laser-Safety-Program.docx)

# Certification

I have read and understand the above SOP. I have received approval from my Lab Director to perform this procedure. I agree to contact my Supervisor or Lab Manager if I plan to modify this procedure.

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| Name | Signature | UMID # | Date |
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| Lab Director |  | Revision Date |

# Major Revisions (Tracking purposes only – Do not print as part of SOP)

|  |  |
| --- | --- |
| Date | Revision |
| 02-25-19 | Updated links and certification (DML). |
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