

Laser Standard Operating Procedure (SOP)

Introduction:

All authorized personnel and laser users are required to use this document to develop an SOP for the use of Class 3B and/or Class 4 lasers. The SOP will detail alignment, operation, and maintenance procedures for each laser. Site and/or procedure specific non-beam hazards and their appropriate controls should be included.

Instructions:

- Use the template to create a standard operating procedure (SOP) for each setup involving Class 3B and/or Class 4 lasers including activities for fixed or permanent laser systems as well.
NOTE: All laser users, including visitors, must be escorted by authorized personnel at all times, briefed on proper safety protocols, and wear laser protective eyewear appropriate for the level of hazard.
- Laser Owners or Managers must incorporate this SOP as part of the training for users of the laser system and always ensure adherence to the outlined procedures. An SOP is an important component of any operational on-the-job training.
- Every laser user who has been trained with this SOP procedure must provide a signature for the “Laser User Acknowledgement,” at the end of this document.
- The SOP must be placed in a conspicuous location near the laser or laser system and be readily available for review by the Laser Safety Officer, laser user, and other appropriate EHS and UA official(s) at all times.

Section A: Laser Registrant

Authorized Laser Operator (ALO):		Laser System Location: (Department/Room/Bldg.)	
ALO Office Phone Number & Email:			
Laser Operator(s): (Check all that apply)	<input type="checkbox"/> Paid Staff/Faculty <input type="checkbox"/> Enrolled Student(s) <input type="checkbox"/> Volunteer Employees <input type="checkbox"/> Visitors		

Section B: Laser System Information

Laser Model Number:		Laser Serial Number:	
Laser Classification:			
Active Medium: (i.e. Argon Ruby Nd:YAG Diode)			
Laser Wavelength: (nanometers)			
Laser Beam Divergence: (mrad)			
Laser Beam Diameter: (mm)			
<input type="checkbox"/> Continuous Wave	Average Power (W):		Maximum Power (W):
<input type="checkbox"/> Repetitively Pulsed	Energy per Pulse (J):		Pulse Repetition Frequency (Hz):
<input type="checkbox"/> Single Pulse	Pulse Duration (sec):		Pulse Width (s):
<input type="checkbox"/> Q-Switched	Peak Pulse Power (W):		Peak Power Density (W/cm ²):

Section C: Laser Preparation

(Ensure the steps below are followed during laser and/or laser system operations)

- 1) **Always** follow the guidelines outlined in the Laser Safety Manual.
- 2) Lock the room to prevent unauthorized access during laser operations.
- 3) Ensure the room has the appropriate warning signs for laser activities (see below Section G).
- 4) Ensure the optical set-up is free of foreign objects.
- 5) Ensure required laser safety barriers or curtains are in place.
- 6) Ensure windows and doors are properly covered to prevent laser beam transmission.
- 7) Ensure the emergency egress from the Laser Control Area (LCA) remains unobstructed.
- 8) Ensure all laser operations are performed in accordance with the LSO's instructions and in compliance with the Laser Safety Program.

COMMENTS OR ADDITIONAL INFORMATION



Section D: Laser System Operating Procedures

(Ensure the steps below are followed during laser or laser system operation)

- 1) **Always** follow the guidelines outlined in the Laser Safety Manual.
- 2) If required, ensure all personnel present are wearing adequate PPE .Ensure that eyewear has the appropriate Optical Density for wavelength/power of the laser in use.
- 3) Ensure all jewelry, which may reflect beams, is removed.
- 4) Issue a verbal warning prior to starting the laser operation.
- 5) Ensure all laser operations are performed in accordance with the LSO's instructions and in compliance with the Laser Safety Program.

I. Entering Laser Room

(Specify below the engineering and/or administrative controls you have in place to protect against unauthorized personnel entering the laser control area)

II. Setup

(Explain in sufficient detail the process of setting up the laser operating system)

III. Start-up and Operation

(List the basic sequential events that describe the complete operation, including when to turn on the laser warning light, laser setting, etc. The procedures shall be written for the benefit of the laser user who must read and understand them to perform the operation safely.)

IV. Shutdown

(Describe normal and emergency shutdown procedures.)



Section E: Laser System Beam Alignment Procedures

(When performing beam alignment, follow all applicable safety measures listed below)

- 1) Exclude all unnecessary personnel from the LCA during alignment procedures.
- 2) If possible, use a low power alignment laser or use the lowest possible laser power setting.
- 3) Always wear the proper laser protective eyewear and other applicable PPE during alignment.
- 4) For aligning invisible (IR, UV) beams, use beam display devices (i.e., image converter viewers or phosphor cards) to locate beams.
- 5) Use a shutter or beam block to block the high-powered beams except when absolutely needed for alignment.
- 6) Use a laser rated beam block to terminate high power beams downstream of the optics.
- 7) Locate and block all specular reflections as close to the source as possible.
- 8) Ensure all beams and specular reflections are terminated before high power operation.
- 9) Only trained laser operators are permitted to perform laser alignments.
- 10) **Include below the specific beam alignment instructions, including PPE to be worn and any applicable signs to be used/posted.**
- 11) Ensure all laser operations are performed in accordance with the LSO's instructions and in compliance with the Laser Safety Program.

COMMENTS OR ADDITIONAL INFORMATION:

Section F: Laser Protective Eyewear

For enclosed beams, all personnel utilizing a Class 3B and/or Class 4 laser or laser system **MUST** wear laser protective eyewear. Inspect all eyewear periodically and ensure it is in good condition. Ensure eyewear with the correct Optical Density (OD) and wavelength is provided to all laser operators and individuals in the Laser Control Area during open beam operation. Refer to the Laser Safety Manual for guidance on selecting the appropriate OD for a given wavelength(s).

Eyewear Manufacturer	Eyewear Model	Rated Wavelength (nm)	Optical Density (OD)
<i>Newport Optics</i>	<i>G3982</i>	<i>770-810</i>	<i>5+</i>



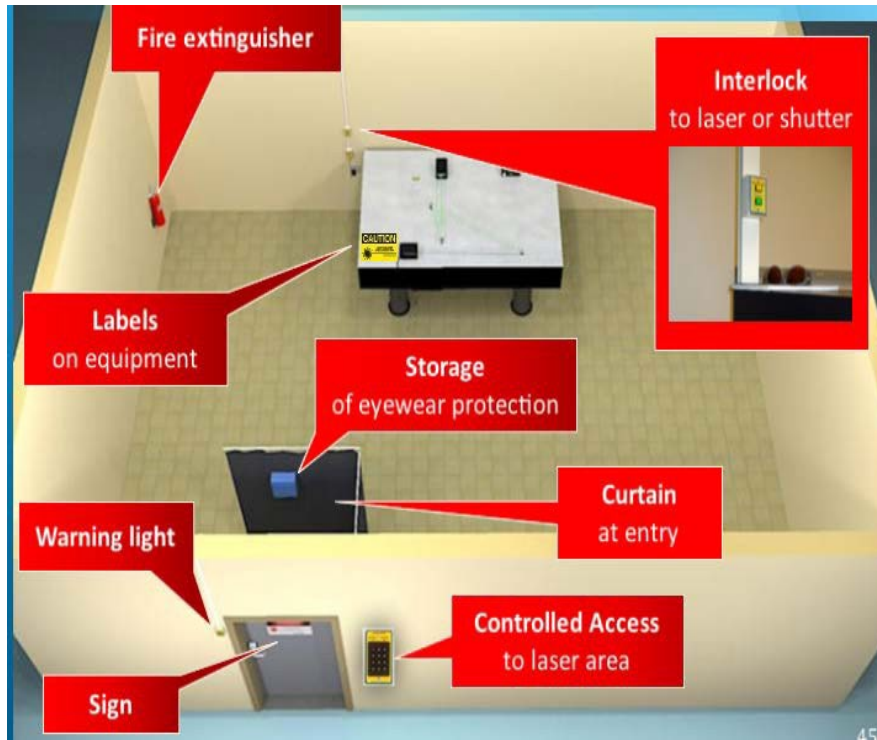
COMMENTS OR ADDITIONAL INFORMATION:



Section G: Diagram of Laser or Laser System Setup

(Show the location of beam stops, interlocks, shielding, mirrors, and other relevant details or attach drawing. Include laser location, beam path, emergency shutdown location(s), and fire extinguisher(s))

EXAMPLE DIAGRAM:



LASER/LASER SYSTEM DIAGRAM:

Section G: Beam Hazards

Check if Present	Beam Path Characteristics	Comments
<input type="checkbox"/>	Beam Path is Clearly Identified	
<input type="checkbox"/>	Beam is Enclosed as Much as Possible	
<input type="checkbox"/>	Beam is Not Directed Towards Hallways, Doors, Desk Areas, Traffic Areas, Laser Control Area Entry Points, or Windows	
<input type="checkbox"/>	Beam is Terminated at the End of its Useful Path	
<input type="checkbox"/>	Beam is Not Located at Sitting or Standing Eye Levels	
<input type="checkbox"/>	Surfaces Scatter Radiation and Minimize Specular Reflections	
<input type="checkbox"/>	Beam is Viewed Remotely	

Section H: Non-Beam Hazards

Check if Present	Non-Beam Hazards	Comments
<input type="checkbox"/>	Electrical Hazards	
<input type="checkbox"/>	Collateral Radiation Hazards	
<input type="checkbox"/>	Plasma Radiation Hazards	
<input type="checkbox"/>	Noise Hazards	
<input type="checkbox"/>	Glass or Nanoparticle Hazards	
<input type="checkbox"/>	Laser Generated Air Contaminant Hazards	
<input type="checkbox"/>	Laser Dye and Solvent Hazards	
<input type="checkbox"/>	Cryogenic Liquid Hazards	
<input type="checkbox"/>	Biological Agent Hazards	
<input type="checkbox"/>	Trip Hazards	
<input type="checkbox"/>	Fire Hazards	
<input type="checkbox"/>	Other (Specify)	



Section I: Laser System Control Measures

(For each hazard present, check the hazard).

Check if Present	Hazard	Comments
<input type="checkbox"/>	Safety Interlocks are Present/Functioning Properly	
<input type="checkbox"/>	The Protective Housing Interlock is Not Bypassed or Overridden During Laser Operation	
<input type="checkbox"/>	An Emergency Stop Button, Key, or Coded Access Pad, is Available Which Will Terminate the Laser Beam Immediately (Class 3B & Class 4)	
<input type="checkbox"/>	An Activation Warning System, a Remote Interlock Connector, and a Beam Stop or Attenuator are in Place and Functioning Properly (Class 4)	
<input type="checkbox"/>	Laser is Securely Mounted on a Stable Platform	
<input type="checkbox"/>	Laser System is Grounded	
<input type="checkbox"/>	Nominal Hazard Zone (NHZ) Clearly Marked	
<input type="checkbox"/>	Protective Barriers, Curtains	
<input type="checkbox"/>	Windows Covered Where Applicable	
<input type="checkbox"/>	No Reflective Surfaces Near Beam	
<input type="checkbox"/>	Laser Warning Signage	
<input type="checkbox"/>	Audible Warning System	
<input type="checkbox"/>	Fire Extinguisher Available	
<input type="checkbox"/>	Emergency Contact Information Located on Door Signage	
<input type="checkbox"/>	Extra Safety Eyewear Available	
<input type="checkbox"/>	Lit Sign Interlocked with Laser Power Supply	
<input type="checkbox"/>	Lit Sign Controlled by Switch	
<input type="checkbox"/>	Mounted Reversible Sign: Green “Laser OFF,” Safe To Enter; Red “Laser ON,” Do Not Enter	
<input type="checkbox"/>	Other (Specify)	



Section J: Laser System Maintenance

Appropriate signage including “Laser Service in Progress” is required for maintenance activities.

COMMENTS OR ADDITIONAL INFORMATION:

Section K: In Case of Emergency

(Refer to the Laser Safety Manual for guidance on reporting accidents involving lasers.)

Laser Safety Officer:		Phone:	
E-Mail:			
Medical Emergencies and Fire:	911, UAPD	Phone:	Emergency: 911 Non-Emergency (UAPD): (205) 348-5454

- 1) Shut the laser off immediately and remove the interlock key. If not possible, alert everyone to exit the room.
- 2) If there is a fire or medical emergency, call UAPD or 911 as necessary.
 - Laser induced medical emergencies include severe injuries from beam exposure such as suspected eye exposure, vision loss, bleeding from the eye, and burns to skin, areas around the eyes and/or on the face.
- 3) **Do not alter the laser setup. It is important to analyze the setup as it existed at the time of injury so we can help find the cause of accident and develop corrective actions to prevent a recurrence.**
- 4) Notify the Laser Safety Officer immediately.

COMMENTS OR ADDITIONAL INFORMATION:



