

# Reed College Laser Safety Program

July 2023



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## 1.0 Purpose and Scope

Lasers may cause serious eye or skin injury if improperly used. Depending on laser intensity and beam characteristics, even indirect viewing or reflected light may pose health hazards. Additionally, laser use often coincides with other hazards related to high voltage, high pressure, noise, radiation, and toxic gases. The Reed College Laser Safety Program is designed to protect employees, students, visitors, and property from the hazards associated with lasers and laser systems. This program applies to all individuals who use lasers at Reed College.

## 2.0 Responsibilities of Positions

### 2.1 Environmental Health and Safety Department (EHS)

EHS is responsible for the laser safety program design, implementation, and oversight. EHS may modify the program to ensure compliance with regulatory requirements and industry best practices. In collaboration with faculty/ lab supervisors, additional training, documentation, medical baseline testing, or protocols may be provided on an as needed basis.

### 2.2 Faculty/Laboratory Supervisors

Faculty/laboratory supervisors are responsible for administering laser safety practices in alignment with this document, the Reed College Laser Safety Manual, and other industry best practices. This includes keeping all lasers and safety equipment in proper working order, maintaining necessary engineering and administrative controls, and ensuring that laboratory technicians are trained to work safely with lasers. Faculty/laboratory supervisors have the authority to remove and bar any individual who is a danger to themselves or others from the lab.

### 2.3 Lab Technicians and Operators

Individuals working with lasers are responsible for understanding the hazards associated with laser use and safety policies designed to protect from those hazards. Reading of the Reed College Laser Safety Manual is required before working with lasers. Technicians must use required safety equipment and follow procedures as instructed by the faculty/laboratory supervisor. Work should be halted if unsafe conditions arise and issues should immediately be reported to the faculty/laboratory supervisor. Failure to follow safety policies or other unsafe practices may result in removal from the lab.

### 2.4 Visitors

All individuals who enter areas where laser hazards exist should act according to the safety guidelines outlined in the Reed College Laser Safety Manual, including but not limited to wearing appropriate personal protective equipment and remaining outside of unauthorized areas. Additionally, any directions given by faculty/laboratory supervisors should be followed.



## 3.0 Training Requirements

### 3.1 Faculty/Laboratory Supervisors

The faculty/laboratory supervisor is responsible for ensuring that all operators have met the appropriate training requirements. Laboratory specific rules and procedures should be provided by the faculty/laboratory supervisor to new operators before allowing work in the lab.

Faculty/laboratory supervisors should review the Reed College Laser Safety Manual prior to beginning work and every two years thereafter, as well as review manufacturer guidelines prior to adding any new equipment or modifying existing lasers or laser systems. All operating safety procedures should be reviewed with lab technicians and operators on an annual basis.

### 3.2 Lab Technicians and Operators

All lab technicians and operators must review the Reed College Laser Safety Manual prior to beginning work and every two years thereafter. All operating safety procedures should be reviewed prior to beginning work and annually thereafter. Additionally, technicians and operators should receive lab specific training from the faculty/laboratory supervisor on administrative procedures, laser alignment, and other applicable protocols. Technicians and operators should review manufacturer safety documentation prior to laser use.

### 3.3 Refresher Training

All laser users will review the Reed College Laser Safety Manual every two years. Operating safety procedures will be reviewed annually. Inactive faculty/laboratory supervisors must complete a refresher training prior to renewing laser use. Additional refresher training will be provided with significant changes to duties, rules, or the terms of the license occur.

## 4.0 Registration and Audits

All class 3B and 4 lasers must be registered with EHS. Registration forms can be found in Appendix 1.

Audits should be conducted by faculty/laboratory supervisors on a biennial basis. Assistance may be provided by members of the Radiation Safety Committee, other faculty/laboratory supervisors who use lasers, or other qualified individuals. Audit criteria are provided in Appendix 2.

## Appendix 1: Laser Registration



## Reed College LASER REGISTRY

I. Faculty or Laboratory Supervisor \_\_\_\_\_

Phone \_\_\_\_\_ Date \_\_\_\_\_ Department \_\_\_\_\_

II. Personnel who use the laser system:

<u>Name</u>	<u>Reed ID#</u>	<u>Status</u> (student or staff)

III. Laser System Information

1. System location (Building/Room#) \_\_\_\_\_
2. Laser warning sign on door (Y/N) \_\_\_\_\_
3. Wording on sign: \_\_\_\_\_
4. Do users wear safety goggles? \_\_\_\_\_
5. Type/Manufacturer: \_\_\_\_\_
6. Do visitors wear safety goggles? \_\_\_\_\_
7. Type/Manufacturer: \_\_\_\_\_
8. In-house service for laser (Y/N) \_\_\_\_\_
9. Contract service company's name: \_\_\_\_\_
10. Is there a written SOP available? \_\_\_\_\_

	<b>Laser 1</b>	<b>Laser 2</b>	<b>Laser 3</b>
Manufacturer			



Model #			
Serial #			
Class (1,2,3a,3b,4)			
Type (CW, Pulsed)			
Description (He-Ne, Nd: YAG, etc.)			
Wavelength(s)			
Maximum Power/ Peak Power (Watts or Joules)			
Pulse Duration (repetition rate)			
Emerging Beam Divergence (mrads)			
Emerging Beam Dimensions (mm)			
Use (holography, alignment, etc.)			

Return completed form to the Department of Environmental Health and Safety,  
 ehs@reed.edu



## Appendix 2: Lab Audit Criteria

### Auditing Laser Beam Hazards

- Determine the locations of all exposed optics and the beam path. The faculty/laboratory supervisor can assist with this.
- Examine the walls of the facility in the beam plane for burn marks or other artifacts to determine if the laser beams have left the optical table. Look behind beam stops to see if they are left out of position.
- Determine if the beam(s) are at eye level when a user is sitting or standing. Examine the optical table for items such as unused optics, tools, etc., which might present a specular reflection hazard.
- Verify that the beam enclosures, beam, tubes, fibers, collimators, etc. are in position, secured and properly used.
- Consider if the beam is being handled in some way which affects the hazard (focusing, enlarging beam diameter, pulse manipulation, filtration, pumping, etc.)
- Examine the laser environment for compatibility with the beam characteristics (cardboard beam stops, uncovered windows, etc.).
- Check all interlocks, switches, and shutters to assure they are working properly.
- Examine laser safety eye wear to determine whether it is appropriate for the laser hazards, is scratched, or has melt marks on the lens. If skin protection is required, make sure it is adequate.
- Check postings, labeling, warning lights, etc. to assure they meet compliance.
- Determine if training, eye exams, etc. requirements have been met by the users.

### Auditing Non-Beam Hazards

- Examine the room for obvious physical hazards (cords, obstructions, etc.).
- Examine the room for fire and explosion hazards (solvent storage issues, blocked fire extinguishers, etc.)
- Determine if toxic laser media (halogen gases, laser dyes, etc.) and their proper controls and precautions are used.
- Survey the area for electrical hazards, concentrating on lasers and laser power supplies. Assure optical tables are grounded.
- Determine if there are any collateral radiation hazards associated with laser power supplies or excitation sources.



## Appendix 3: Operational Safety Procedure Template

### Operational Safety Procedure: Laser Use

Faculty/Supervisor:	Date:
Department:	Laser Location:

*This procedure shall be read and signed annually by all persons who use lasers listed in this SOP.*

#### 1. LASER SAFETY CONTACTS

**Faculty/Laboratory Supervisor:**

\_\_\_\_\_ Home Phone: \_\_\_\_\_

**Lab Safety Contact/Lab Manager:**

\_\_\_\_\_ Home Phone: \_\_\_\_\_

#### 2. LASER DESCRIPTION

A. All Class 3b and 4 lasers must be used in accordance with ANSI Z136.1-2014.

B. List all lasers that make up the system and provide a brief description of how the laser system will be used.

Type	Class	Wavelength	O.D.	Manufacturer	Model	Serial #

C. Specific Non-Beam Hazards of this System (check all that apply)

- Chemical (dyes, solvents, etc.); attach MSDS if applicable
- Electrical (high voltage, current, etc.)
- Laser Generated Air Contaminants
- Compressed gases or cryogenic liquids
- Fire/ignition source
- Other (specify): \_\_\_\_\_

Briefly describe control measures for any items checked above:





**3. LASER ENVIRONMENT**

Define and attach a layout of the laser-controlled area. Show the beam path and location (relative height and direction of travel) in relation to the user. Define the targets.

**4. OPERATING AND SAFETY PROCEDURES**

- A. Target area preparation:
  
- B. Startup Procedures (including manufacturer’s recommended steps and the point at which laser protective eyewear must be donned):
  
- C. Operating procedures (power settings, Q-switch mode, pulse rate, other): for normal use.
  
- D. Shut down procedures:
  
- E. Special Procedures (alignment, safety tests, maintenance tests, other):
  
- F. Emergency procedures:

**5. PERSONNEL PROTECTIVE EQUIPMENT**

- A. Eyewear

LASER EYEWEAR					
For This Laser...			...Wear This Eyewear		
Manufacturer/ Model	Type	Wavelength(s) (nm)	Manufacturer/ model	Optical Density OD	Remarks



B. Other Protective Equipment Required within Nominal Hazard Zone

Item	Location	Usage Condition

**6. OPERATOR REVIEW**

I have read and understood this procedure and its contents, and agree to follow this procedure each time I use the laser or laser system.

**Laser Safety Training**

Name (printed)	Signature	Date

**This Procedure shall be:**

- Read and understood by laser users prior to their initial use of the listed laser.
- Reviewed by all laser users following any modification to the laser or laser system that affects operational parameters.
- Reviewed annually by all laser users.
- This Procedure must be readily accessible and available for reference by laser users.

