

THE UNIVERSITY OF TEXAS AT TYLER



LASER SAFETY  
PROGRAM

2020

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# **The University of Texas at Tyler**

## **LASER SAFETY PROGRAM**

### **INTRODUCTION**

The University of Texas at Tyler has established a Laser Safety Program to provide controls and safety guidance for research and educational activities involving lasers. This program is established to meet the requirements of 25 Texas Administrative Code 289.301 and to institute prudent safety practices. If any conflict occurs between this Program and the Texas Code, the latter shall prevail. The primary guidance document for safety practices is the American National Standards Institute Safe Use of Lasers (ANSI Z- 136.1).

University employees concerned with using lasers will comply with the procedures in this manual. The Director of Environmental Health and Safety is the person designated by the President as responsible for the Laser Safety Program and has the authority to set laser safety policy, suspend activities deemed unsafe, and require and direct remedial action where necessary.

### **PURPOSE**

This manual is prepared to make individuals who work with lasers and laser systems aware of the risks, safe practices, requirements, and certain responsibilities.

This program applies to all lasers and laser systems operated under the authority of the University of Texas at Tyler. This includes acquisition, manufacture, registration, use, monitoring, transfer, and disposal of lasers. The proper implementation of this program will ensure that laser exposures are always below the maximum permissible exposure (MPE) limits.

### **RESPONSIBILITIES**

#### **Laser Safety Officer**

The Laser Safety Officer (LSO) is responsible for the following, as a minimum:

- Ensure the proper classification of all lasers, including user modifications.
- Ensure proper registration of class 3B and 4 laser with the State of Texas.
- Perform hazard evaluations for all class 3B and 4 lasers and laser work areas.
- Specify control measures for all class 3B and 4 lasers and ensure implementation.
- Approve procedures, SOPs, laser eyewear, protective equipment, signs and labels.
- Inspect laser eyewear and other equipment, for proper condition and function.
- Ensure that all laser personnel receive appropriate safety training.

- Maintain accurate inventory of class 3B and 4 lasers.
- Monitor the program and ensure compliance with safe practices.
- Maintain program records.
- Implement State requirements for laser use.

The LSO shall have final authority in determining laser control measures and may approve alternate controls when these are appropriate based on the judgment of the LSO. Class 3B and class 4 lasers shall be operated only with the written approval of the LSO. The LSO shall have the authority to terminate laser operations at any time.

The LSO may appoint a Laser Safety Manager (LSM) and may delegate duties to the LSM in accordance with ANSI Z136.1.

### **Principal Investigator**

The Principal Investigator (PI) shall be designated by the LSO for each class 3B or 4 laser. The PI shall have the responsibility and authority to ensure laser safety compliance for their personnel and equipment. The PI is responsible for the following, as a minimum:

- Ensure all lasers have been properly classified
- Ensure proper registration of class 3B and 4 lasers with the LSO
- Have direct accountability for all class 3B and 4 lasers and laser work areas
- Implement approved control measures for all class 3B and 4 lasers
- Generate SOPs for laser use and alignment, and submit to LSO
- Ensure that all laser personnel receive appropriate safety training
- Actively ensure lab practices are in compliance with safety requirements
- Maintain records of laser purchases, use, transfer, and disposal

### **Employees Working with Lasers**

Employees who work with class 3B or 4 lasers with the beam exposed shall:

- Energize or work with lasers only when authorized to do so.
- Comply with laser safety rules and work procedures.
- Notify their supervisor, lab safety contact, or the LSO in case of potential accident or injury, or in case of a suspected unsafe condition.

## **LASER CLASSES**

Class 1 laser systems are incapable of producing damaging radiation levels during normal operation and are exempt from any control measures. Class 1 laser systems may contain embedded higher class lasers and may produce laser hazards if operated with interlocks defeated. Only authorized personnel may operate those class 1 laser systems with interlocks defeated.

Class 1M laser systems are incapable of producing hazardous exposure conditions during normal operation unless the beam is viewed with optical instruments.

Class 2 laser systems emit visible light only at a power level of 1 milliwatt or less. The normal aversion response to bright light is adequate protection. Staring into the beam of a class 2 laser is hazardous.

Class 2M laser systems emit visible light only. The normal aversion response to bright light is adequate protection for unaided viewing. However, viewing the beam with optical aids is potentially hazardous.

Class 3A/R laser systems are potentially hazardous under some viewing conditions, but the probability of an actual injury is small, and the control measures for safe use are straightforward.

Class 3B laser systems shall be operated only in laser controlled areas by authorized operators. Operators of class 3B laser systems shall receive approved laser safety training. A written Standard Operating Procedure (SOP) is required for class 3B laser operation. Class 3B laser systems are eye hazards for intrabeam viewing and specular reflections, even for momentary exposures, but diffuse reflections are not usually hazardous.

Class 4 laser systems are eye hazards and skin hazards for intrabeam exposures, specular reflections, and diffuse reflections. They are also fire hazards and may produce laser generated air contaminants. Class 4 laser systems shall be operated only in laser controlled areas by authorized operators. Operators of class 4 laser systems shall receive approved laser safety training. A written SOP is required for class 4 laser operation.

## **LASER RADIATION**

All class 3B and 4 lasers shall be properly documented and registered with the State of Texas. The agency currently responsible for enforcing State laser regulations is the Texas Department of State Health Services, Radiation Control Program.

## **TRAINING REQUIREMENTS**

All operators of class 3B and 4 lasers and laser systems and all incidental personnel or spectators who may be allowed to enter laser controlled areas shall receive approved laser safety training before operating the laser or entering laser controlled areas.

## **NOTIFICATIONS AND REPORTS**

Notification of laser injuries will be made to the State by telephone as soon as practical, but not to exceed 24 hours from the time of the incident. A written report on the incident and any injuries sustained will be made to the State within 30 days of the incident.

## **MEDICAL SURVEILLANCE**

Response to laser injuries will be handled on a case-by-case basis, with emphasis on limiting injury and regaining health. Written guidelines shall be available, for immediate actions and ongoing treatment, and for administrative processes. Laser personnel shall report any suspected hazardous exposure to the LSO immediately. Baseline eye exams are not required. A medical eye exam may be required immediately following a suspected hazardous exposure, under the guidance of medical personnel.

## **CONTROL MEASURES**

All class 3B and 4 lasers shall be operated in a laser controlled area. The requirements for individual laser controlled areas shall be determined by the LSO. The minimum requirements for laser controlled areas are:

Entryway controls to allow only authorized personnel or approved spectators to enter the laser control area. (Administrative controls are acceptable.)

- Conspicuously posted sign or signs, giving adequate instruction for the protection of personnel.
- Laser safety eyewear available and used in accordance with the SOP for class 3B and class 4 lasers.
- Beam control (barriers and beam blocks) to limit laser hazards within the controlled area.
- Written SOP (see Appendix A) for class 3B and class 4 lasers.
- Training of operators of all class 3B and 4 lasers.

## **EYEWEAR POLICY**

Laser safety eyewear is normally required for the operation of class 3B and class 4 lasers with exposed beams. The LSO will require eyewear or approve laser operation without eyewear on an individual basis, based on a hazard evaluation performed by the LSO.

Eyewear shall be selected for providing an adequate level of protection from the laser and for suitability to the wearer and environment. Eyewear shall be inspected annually to ensure that the protection level has not degraded through use and beam exposure.

## **AUDITS**

An audit of all class 3B and 4 lasers and the Laser Safety Program shall be conducted annually by the LSO or designee.

## **LAB SURVEYS**

A laboratory laser survey (see Appendix B) is required for all class 3B and 4 lasers. The PI will complete the survey each semester and submit a copy to EH&S.

## **RECORDS**

The LSO shall maintain records which document the Laser Safety Program. These records shall include:

- Laser hazard analysis reports for all class 3B and 4 lasers.
- Training records for all operators of class 3B and 4 lasers.
- Standard Operating Procedures for all class 3B and 4 lasers.
- Approvals of alternate laser control measures.
- Laser Safety Audit reports.
- Laser Inventory.
- Laser Accidents and Incidents.

Specific records and retention periods are required by State regulation. These records will also be maintained by the LSO, and will be available for inspection at the request of State agents.

# **APPENDIX A**



#### 4. HAZARDS & CONTROLS

HAZARDS AND CONTROLS		
Check if applicable	HAZARD	CONTROL(S)
<input type="checkbox"/>	High Voltage	
<input type="checkbox"/>	Capacitors	
<input type="checkbox"/>	Unenclosed Beam Access to Beam	
<input type="checkbox"/>	Fumes/Vapors	
<input type="checkbox"/>	Ultraviolet Radiation or Blue Light	
<input type="checkbox"/>	Compressed Gases	
<input type="checkbox"/>	Hazardous Chemicals/Waste	
<input type="checkbox"/>	Housekeeping	
<input type="checkbox"/>	Reflective Material in Beam Path	
<input type="checkbox"/>	Fire	
<input type="checkbox"/>	Laser at eye level of person sitting or standing	
<input type="checkbox"/>	Infrared Lasers	
<input type="checkbox"/>	Correct Eyewear	

COMMENTS:

<b>ADDITIONAL CONTROLS</b>		
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Check if applicable	CONTROL	COMMENTS
<input type="checkbox"/>	Entryway (door) Interlocks or Controls	
<input type="checkbox"/>	Laser Enclosure Interlocks	
<input type="checkbox"/>	Laser Housing Interlocks	
<input type="checkbox"/>	Panic Button Emergency Stop	
<input type="checkbox"/>	Beam Stops	Infrared Laser must terminate in fire-resistant material and the absorber must be inspected at least quarterly <sup>1</sup>
<input type="checkbox"/>	Master Switch (operated by key or computer code)	
<input type="checkbox"/>	Laser Secured to Base	
<input type="checkbox"/>		

COMMENTS:

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<sup>1</sup> Required by 25TAC§289.301(s)(1)

**5. PERSONAL PROTECTIVE EQUIPMENT**

A. Eyewear

<b>LASER EYEWEAR</b>					
<b>For this Laser...</b>			<b>...Wear this Eyewear</b>		
<b>Acquisition date</b>	<b>Type</b>	<b>Wavelength (nm)</b>	<b>Wavelength Attenuated (nm)</b>	<b>Optical Density (OD)</b>	<b>Remarks</b>
(example) Aug 99	CO2	10,600	10,600	At least 3.5	Glendale-white frames

Identify each set of laser protective eyewear with a unique designation (name or number).

The following check shall be done annually. Discard unfit eyewear.

<b>Item</b>	<b>Comments</b>	<b>Date/Initial</b>
Adequate pairs of eyewear for all needs.		
Eyewear specific to wavelength		
OD appropriate for full range of power; alignment to power ops		
Fit snugly		
Labeled for wavelength and OD		
Free of damage excessive scratches		

What (item):	And is available from (where)	which must be worn (when):
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**6. OPERATING PROCEDURES**

A. Initial preparation of lab environment for normal operation (key position, warning light on, interlock activated, identification of personnel, other)

B. Target area preparation

C. Operation procedures are as follows:

D. Shutdown procedures for this laser are as follows:

E. Special procedures (alignment, safety tests, interlock bypass, emergency, etc.)



# **APPENDIX B**

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## LABORATORY LASER SURVEY

YES-NO-N/A

### 1. Labels and Signs

Is the correct warning label affixed to the laser? \_\_\_\_\_

Are signs posted clearly near the laser? \_\_\_\_\_

Is the room posted? \_\_\_\_\_

Is a label, sign, or warning posted near the aperture? \_\_\_\_\_

Is a label or warning posted near an interlock? \_\_\_\_\_

### 2. Engineering Controls

Does each laser have a keyswitch or code? \_\_\_\_\_

Is appropriate Safety eyewear provided and present? \_\_\_\_\_

Is the eyewear permanently and prominently labeled  
for optical density and wavelength? \_\_\_\_\_

Do Safety Covers have interlocks? \_\_\_\_\_

Are latches or interlocks provided to restrict access  
to the Controlled Area? \_\_\_\_\_

Are all warning devices functioning within design  
specifications? \_\_\_\_\_

Are any items in or near beam paths which could cause  
specular reflections? \_\_\_\_\_

Is a physical barrier present at the Controlled Area entry? \_\_\_\_\_

### 3. Procedural Controls

Is each laser registered properly? \_\_\_\_\_

Is a Laser Safety Supervisor present? \_\_\_\_\_

Is access to the Controlled Area restricted? \_\_\_\_\_

Does each person have required training? \_\_\_\_\_

Is the SOP for the laser present at the control? \_\_\_\_\_

Are curtains in place and used (If required)? \_\_\_\_\_

Is documentation available? \_\_\_\_\_

# **APPENDIX C**

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## NON-RADITION LASER HAZARDS SURVEY

ITEM	YES/NO/NA
<b>1. Electrical</b>	
Are there any exposed wiring terminals or connections?	_____
Is a positive On/off switch available and connected?	_____
Are all connections permanent (Screwed or clamped)?	_____
Are personnel trained in CPR?	_____
Is access to the power supply controlled?	_____
<b>2. Chemical (If applicable)</b>	
Is personal protective equipment available (Gloves, etc.)?	_____
Is a Material Safety Data Sheet available?	_____
Is absorbent or diluent available?	_____
Are personnel trained in the hazards of the chemical?	_____
<b>3. Cutting Edge (If applicable)</b>	
Is the cutting edge identified prominently?	_____
Are personnel trained in safety for this hazard?	_____
<b>4. Compressed Gases (If applicable)</b>	
Is the gas cylinder properly secured and connected?	_____
Is an MSDS available for the gas (If required)?	_____
Are personnel trained in safety for this hazard?	_____
<b>5. Ventilation</b>	
Is proper ventilation present for the laser space?	_____
<b>6. Noise</b>	
Are noise levels excessive?	_____
Is hearing protection available?	_____
Are personnel trained in safety for this hazard?	_____
<b>7. Confining Space, Explosion, Physical Safety (As applicable)</b>	
Is the hazard identified?	_____
Is training provided in safety for this hazard?	_____
Is protective equipment available?	_____