LASER SAFETY PROGRAM

Laboratory Safety Manual ~ Appendix Q

Parts I through VII of this template must be completed before your WSU Laser Safety Program for ***Class 3 and 4 Lasers*** *is initiated. After first completing Parts I through III, send a copy of Appendix Q to Tom Ebeling of Environmental Health and Safety (EH&S) at tom.ebeling@wsu.edu (email) or Mail Stop 1172. It is recommended you store the completed form with your other laboratory safety documents where it is readily accessible to all lab personnel. If further assistance is needed, contact EH&S at 509-335-3041.*

PART I: Authorized Personnel and Pertinent Information:

Responsible for Laser Safety (Refer to Responsible Parties in Appendix P):

- Principal Investigator/Supervisor (acts as Laser Safety Officer):
- E-Mail: • Phone Number:
- Department or Unit:
- Department Chair or Director:

Area(s) Covered by this Program (i.e., Building, Room Numbers, Construction Site, etc.):

PART II: Laser Information:

Used to determine Maximum Permissible Exposure Limit, Nominal Hazard Zone, and Optical Density, please provide information in the requested units (i.e. Joules, Watts, etc.). The specific information requested is usually found in the specification pages of the manuals supplied by the laser manufacturer.

- **Laser Class** (check one that applies):
  Class 1 Class 2 Class 3R Class 3B Class 4
- **Laser Type** (i.e., Diode, ND:Yag, Helium Neon, etc):
- **Manufacturer**: • **Model Number**:
- **Wavelength(s) or Wavelength Ranges**: nanometers (nm)
- **Please briefly describe your laser application** (i.e. Laser Welding, Scribing, Cutting, etc.):
- **Mode** (check either continuous wave, single pulse, or multiple pulse and provide information):
  Continuous Wave:
  - Maximum Average Power: Watts
  - Exposure Time: Seconds
  - Exposure Distance: Meters

*NOTE: For diffuse viewing Optical Density calculations, the optical density analysis requires the magnitude of the distance from the scattering site to the observer. Unless otherwise specified, a quarter of a meter (0.25m) will be used as the "viewing distance".

☐ **Single Pulse:** ▪ Pulse Energy: _____ Joules ▪ Pulse Length: _____ Seconds

☐ **Multiple Pulse:** ▪ Pulse Energy: _____ Joules ▪ Average Power: _____ Watts
▪ Pulse Length: _____ Seconds ▪ Pulse Rate: _____ Hertz

- **Beam Shape** (check one): ☐ Circular ☐ Elliptical ☐ Rectangular ☐ Square
- **Beam Diameter at Exit of Laser**: _____ mm ▪ **Beam Divergence:** _____ mrad
- **Used to determine the Nominal Hazard Zone for lens** (check one and provide information):
  ☐ Non-Applicable (N/A)
  ☐ Applicable: ▪ Focal Length: _____ mm ▪ Beam Diameter at Lens: _____ mm
- **Used to determine Nominal Hazard Zone for fiber optics** (check one and provide information):
  ☐ Non-Applicable (N/A)
  ☐ Single Fiber Optics Mode: ▪ Minimum Beam Waist: _____ µm
  ☐ Multiple Fiber Optics Mode: ▪ Numerical Aperture: _____
- **Engineering Controls** (check all that apply):
  ☐ Non-Applicable ☐ Protective Housing ☐ Interlocks ☐ Beam Stops
  ☐ Optical System Attenuators ☐ Enclosed Beam Paths ☐ Remote Control ☐ Emission Delays

PART III: Sign and Send to EH&S:

Once the information has been provided in Parts I and II, sign, date, and send the information to EH&S:

Signature: _____ ***Date***: _____

PART IV: EH&S Calculations & Return to Sender:

Once EH&S receives the information provided in Parts I, II, and III, the following will be determined for class 3B and 4 lasers only:

- **Maximum Permissible Exposure (MPE):**
- **Nominal Hazard Zone (NHZ):**
- **Optical Density (OD) Protective Eyewear:** _____

EH&S Signature: _____ ***Date***: _____

PART V: Standard Operating Procedure / Hazard Assessment

With the information provided in Parts I, II, III, and IV, complete standard operating procedure / hazard assessment for all Class 3B and 4 Lasers (See SOP Example). If assistance is needed, contact EH&S at 509-335-3041. Place a completed copy with your other laboratory specific safety documents.

1. **Introduction:** Descriptions of Laser (See label and manufacturer's manual)	**System Description:** **Type & Wavelength:** **Class:** **Location:** **Intended Application:**
2. **Hazards:** List all hazards associated with the laser.	**Eye and skin hazards from direct and diffuse exposures:** **Electrical Hazards:** **Laser Generated Air Contaminants:** **Other Recognized Hazards:**
3. **Control Measures:** List control measures for each hazard.	**Eyewear requirement, include wavelength and Optical Density:** **Additional PPE:** **Location of PPE:** **Description of controlled area, nominal hazard zone and entry controls:** **Reference to Laser Manufacturer's Manual:** **Alignment Procedures (or guidelines):** **Maintenance Procedures:**

4. **Training Requirements:** State specific requirements.	**The specific training requirements for authorized personnel are:**
5. **Emergency Procedures:** List contact information and emergency actions.	IN CASE OF EMERGENCY: **Notify PI / Supervisor (LSO):** **Phone**: For Emergency Medical Response call **Phone #:** **or 911** ACTION TO BE TAKEN: **Report all incidents to:** **Phone**: **Additional Procedures:**
6. **Approved Personnel:** All individuals approved to operate / maintain the laser.	**Names of Authorized Users:** **Authorized Maintenance /Service Personnel:** ***ONLY trained and authorized personnel are allowed to operate and maintain laser.**
7. **Certification of SOP / Hazard Assessment:**	Name of Principal Investigator/Supervisor (acts as Laser Safety Officer): ***Name (Print):*** ***Title (Print):*** ***Signature:*** ***Date:***

PART VI: Medical Surveillance

Has medical surveillance program for laser been implemented (Check Yes or No)? ☐ Yes ☐ No

If yes, provide details with participants name and date of examination:

PART VII: Additional Information

This section has been provided for reminding you to insert additional information pertinent to your WSU Laser Safety Program to make it effective. For example, Part VI might include the following:

- Laser Manufacturer's Manual
- Beam Alignment Procedures
- Maintenance Instructions
- ANSI Laser Standard
- Personal Protective Equipment (PPE) Information
- Cleaning Manuals

EXAMPLE - Standard Operating Procedure for Laser Operation

1. **Introduction:** Descriptions of Laser	**System Description:** Model 1000 Nd:YAG laser marker system manufactured by the XYZ Company. This is a Class 1 laser system with an embedded Class 4 Laser. **Type and Wavelength:** 1064 nanometers **Class:** Class 1 with Embedded Class 4. **Intended Application:** Research **Location:** Webster Hall, Room XYZ
2. **Hazards:** List all hazards associated with the laser	**Eye and skin hazards from direct and diffuse exposures:** Eye Hazard from direct, reflected or scattered beam. Skin hazard from direct beam. **Electrical Hazards:** Inside power supply **Laser Generated Air Contaminants:** Target material **Other Recognized Hazards:** Fire hazard
3. **Control Measures:** List control measures for each hazard.	*INCLUDE THE FOLLOWING*: **Eyewear requirement, include wavelength and Optical Density:** Approved laser safety eyewear with OD=5.0+ @1064 nm is required for all personnel inside the controlled area. **Additional PPE:** Lab coat, long pants, and closed-toed shoes. **Location of PPE:** OD=5.0+ Glasses are stored in cabinet to left of door prior to entry zone. **Description of controlled area, nominal hazard zone and entry controls:** Established controlled area using laser barrier and warning signs, Nominal Hazard Zone is 100 meters = entire lab. **Reference to Equipment Manual:** See Model 1000 Nd:YAG Laser Manual and ANSI Standard Z136.1 **Alignment Procedures (or guidelines):** See C.2.Part IV, Additional Information - Manual for beam alignment procedures. The following rules must be observed during the laser alignment: Only two trained personnel are allowed in the area during alignment procedures. All other activities are prohibited in the same room, unless appropriate protection is provided. Only essential personnel with the appropriate personal protective equipment are allowed in the work area. Place Warning Signs at entrances informing visitors of the dangers. Use low power visible lasers to simulate the path of the high power laser. When performing alignment procedures, reduce all high power laser beams to the minimum possible power. Avoid beam paths that are at sitting or standing eye level. Take off all reflective objects (e.g., rings, badges, watches) before performing any work involving the lasers. Terminate laser beams and specular reflection on diffuse reflecting beam blocks. Keep all combustibles, tools, and reflective surfaces away from the beam path. Make sure you know where the beam is and stay clear. **Maintenance Procedures:** To be performed only by authorized maintenance personnel with the appropriate personal protective equipment (See Unit's Laser Safety Program, Part I for a list of Authorized Personnel). Follow Manufacturer's instructions (See Unit's Laser Safety Program, Part VII Additional Information – Manufacturer's Manual). **Power Supply:** Work involving access to the power supply is normally done with the system locked and tagged out. Access to the energized power supply must be done only by qualified personnel using the buddy

	system. Workers are directed to review the electrical safety and power supply sections of the manual before any activities involving access to high voltage. **Exhaust System:** When functioning normally, the exhaust system will remove all Laser Generated Air Contaminants even with the protective housing open. Notify Dr. Doe at 555-5555 if you think there might be a problem or contact EH&S at 335-3041.
4. **Training Requirements:** State specific requirements.	**The specific training requirements for authorized personnel are:** Laser safety training is required before personnel will be authorized to be in the controlled area while the beam is accessible.
5. **Emergency Procedures:** List contact information and emergency actions.	IN CASE OF EMERGENCY: **Notify PI / Supervisor (LSO):** Dr. Doe **Phone:** 555-5555 For Emergency Medical Response call **911** **Report all incidents to:** Dr. Doe **Phone:** 555-5555 **Additional Procedures:** If accident or injury, complete online incident report through Human Resources Services website.
6. **Approved Personnel:** All individuals approved to operate / maintain the laser.	**List all authorized operators:** Dr. Doe, Principal Investigator & Laser Safety Officer Jane Doe, Laser Assistant Ms. ANSI, Research Tech **List all authorized service personnel:** John Doe, Laser Tech
7. **Certification of SOP / Hazard Assessment:**	**Name of Principal Investigator/Supervisor (acts as Laser Safety Officer):** ***Name (Print):*** John Doe ***Title (Print):*** Principal Investigator & Laser Safety Officer (LSO) ***Signature:***  ***Date:*** 4 March 2020