

**THE UNIVERSITY OF TOLEDO
LASER STANDARD OPERATING PROCEDURE (SOP) FORM**

The ANSI Z136.1 recommends written SOPs for activities involving Class 3b lasers, and requires written SOPs for Class 4 lasers and laser systems. The University of Toledo's Laser Safety Manual requires SOPs for all Class 3 and Class 4 lasers. A SOP should be a concise document that gives safety instructions specific to the laser and associated equipment.

Laser Identification & Characteristics

Department	
Building/Room	
Primary Investigator	
Laser Type	
Laser Class	
Manufacturer	
Maximum Power (Watts)	
Maximum Energy (Joules)	
Operational Wavelengths (nm)	
Beam Size @ aperture (mm/cm)	
Divergence (μ rad/mrad)	
Exposure duration (ms/s)	

Choose one:

- continuous wave
- single pulsed <1 Hz
- repetitively pulsed >1 Hz

Maximum Permissible Exposure (MPE): _____
(Assistance provided by Laser Safety Officer)

Calculated Nominal Hazard Zone

For this laser is: _____ and the area of the NHZ has been demarcated.

Nominal Hazard Zone (NHZ)

The NHZ relates to the space within which the level of direct, reflected, or scattered radiation during normal operation exceeds the appropriate MPE. Exposure levels beyond the boundary of the NHZ are below the appropriate MPE level. No control measures are needed outside the NHZ.

All areas within the walls of rooms or laboratories that house Class 3b or Class 4 shall be considered NHZs at the University of Toledo.

The NHZ may also be calculated using the following formula:

$$NHZ = \frac{1}{\phi} \left[\left(\frac{4\Phi}{\pi * MPE} \right)^{\frac{1}{2}} - a \right]$$

Where ϕ is the emergent beam divergence measured in radians; Φ is the radiant power (total radiant power for continuous wave lasers or average radiant power of a pulsed laser) measured in watts; and a is the diameter of the emergent laser beam, in centimeters.

Hazards associated with this laser (check all that apply):

- Eye
- Skin
- Electrical
- Chemical
- Fire
- Air contaminants

Please describe:

- Other

Please describe:

(Example: compressed gases, excimer gas lasers), dyes, cryogenic liquids, toxic fumes and gases, ionizing radiation, and toxic materials. Consideration should also be given to the *proper disposal* of any hazardous materials)

Control Measures.

For each hazard listed above briefly state the control measures to be used.

Specific type of eye and/or skin protection used (include OD of eye protection)

Description of entryway controls

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Reference to equipment

NHZ procedures

Shutdown procedures

Other controls in place

Alignment Procedures for this Laser (*list here or attach*)

De-energization procedures when working on exposed electrical parts
(*See Lockout/Tagout Guideline for assistance*)(*List here or attach*)

Training Requirements

All users of this laser must first receive the following training:

- Laser Safety Training and:
- Lab Specific Training: (describe)_____

All training for this laser is provided by the Laboratory PI or Designee (Lab Specific) and the Laser Safety Officer (General Laser Safety)

Emergency Procedures

List actions to be taken in case of emergency and personnel to be contacted.

Approved Personnel

List all individuals who are approved to operate the laser without supervision.

Note: A hazard evaluation assisted by the Laser Safety Officer is also required by ANSI for Class 3b and 4 lasers and associated equipment. This should be kept on file or attached to your SOP.