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Cleveland State university makes all reasonable efforts to:

1. Protect the health and safety of Cleveland State University (CSU) faculty, staff, and students.
2. Provide safe work practices- academic, research, and administrative for faculty, staff, and students.
3. Provide information to faculty, staff, and students about health and safety hazards.

3. Laser users:
    a. Know the hazards and precautionary procedures for laser use in the work area.
    b. Attend required training(s)
    c. Plan and conduct operations in accordance with established procedures and good safety practices.
    d. Use personal Protective equipment in accordance with prescribed training.

Lasers are divided into number of classes depending upon the power or energy of the beam and the wavelength of the emitted radiation. Laser classification is based on the laser's potential for causing immediate injury to the eye or skin and/or potential for causing fires from direct exposure to the beam or from reflections from diffuse reflective surfaces. A qualitative description of laser classes can be found below (ANSI Z136.1-2014).

Class 1 laser system:
Considered to be capable of producing exposure conditions during normal operation unless the beam is viewed with an optical instrument such as an eye-loupe (diverging beam) or telescope (collimated beam) and Exempt from any control measures other than to prevent potentially hazardous optically aided viewing; and is exempt from other forms of surveillance. Standard laser copiers , laser printers, optical scanners, or equivalent equipment will be assumed to be class 1 lasers enclosed in a protective housing and will be exempt from filing a Laser Safety Plan unless the user or office knows of any reason that the equipment would not be considered a class 1 laser. Laser pointers and similar low power devices do not require a laser safety plan. User of these low power systems shall read the safety precautions in the manufacturers literature and safety information posted on the Universities Laser Safety webpage.

Class 2 Laser system:
Emits radiation in the visible portion of the spectrum (0.4 to 0.7 μm), and Eye protection is normally afforded by the aversion response

Class 2M laser system:
Emits in the visible portion of the spectrum (0.4-0.7 μm) and
Eye protection is normally afforded by the aversion response for unaided viewing.
However, Class 2 M is potentially hazardous if viewed with certain optical aids.

Class 3 systems: (medium power)
May be hazardous under direct and specular reflection viewing conditions but is normally not a diffuse reflection or fire hazard.

There are two subclasses:

- A Class 3 R laser system is potentially hazardous under some direct and specular reflection viewing conditions if the eye is appropriately focused and stable, but that probability of an actual injury is small. The laser will not post either fire hazard or diffuse-reflection hazard.
- A Class 3B laser system may be hazardous under direct and specular reflection viewing conditions but is normally not a diffuse reflection or fire hazard.

Class 4 system: (high power)
Is a hazard to the eye or skin from the direct beam, and
May pose a diffuse reflection or fire hazard
May also produce laser generated air contaminants (LGAC) and hazardous plasma radiation.

Commercially produced lasers are classified according to the CDRH Federal Standard (FLPPS, 21 CFR 1040) and identified by labels affixed to the laser. Removal of protective housing or

3. Laser systems must have the appropriate warning labels with the laser sunburst logotype symbol and the appropriate cautionary statement. See Section 7.0.
4. Removal of protective housing or system modification can increase a laser's classification. Contact the LSO for review prior to servicing or system modification.
5. Use of class 3R laser with telescopes, microscopes, or alignment devices should be reviewed by the LSO prior to operation.

A laser hazard analysis, including determination of the MPE and Nominal Hazard Zone (NHZ), must be made by the LSO. If it is determined that the classification associated with the maximum level of accessible radiation is Class 3b or 4, a laser-controlled area is established and control measures instituted. Control measures are only required within the NHZ.

Class 3B Control areas

1. Must be controlled to permit lasers and laser systems to be operated only by authorized personnel.
2. Must be posted with the appropriate warning sign(s). See Section 7.0.
3. All area or entryway safety controls must be designed to allow rapid egress by laser personnel and admittance to the laser-controlled area under emergency conditions.
4. Must be operated in a manner such that the laser beam path is well defined and projects into a controlled airspace when the laser beam must extend beyond an indoor controlled area, particularly to the outdoors under adverse atmospheric conditions, i.e. rain, fog, snow, etc.
5. Must be under the direct supervision of an individual knowledgeable in laser safety.
6. Must have all windows, doorways, open portals, etc. either covered or restricted in such a manner as to reduce the transmitted laser radiation to levels at or below the applicable ocular MPE.
7. Must have only diffusely reflecting materials in or near the beam path where possible.
8. Must have appropriate personal protective equipment readily available (i.e., eye protection).

Class 4 laser control areas

1. Control area interlocks or alternate controls to preclude the entry of unprotected personnel while Class 4 laser radiation is present in the control area. The interlock system may be designed to preclude entry while the laser is operating or to terminate laser operation when the door is opened without deliberate overriding of the interlock by a trained laser user.

   If the above measure is not feasible then a,b,c, must be done.

   a. Blocking barrier, screen, curtains, etc. must be used to block, screen, or attenuate the laser radiation levels so that the MPE is not exceeded at the entry point.

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flashing light (visible through protective eyewear) is acceptable entryway warning light alternatives.

c. Personnel trained on entryway procedures and adequate personal protective equipment provided upon entry.

All laser protective windows must be labeled with the optical density and wavelength(s) for which protection is afforded and should be labeled with the threshold limit and exposure time for which the limit applies, and the conditions under which protection if afforded.

Labeling of laser Protective Barriers
W

The PI/LSC is responsible for maintaining all laser safety-related records (i.e., laser safety training, SOPs, inspections/ audits, medical surveillance) for each employee for a minimum of one year

A Laser Safety Plan (LSP) is a means for documenting the assessment of the hazards associated with the laser system and its use. The person responsible for the laser system is responsible for completing a hazard analysis and implementing measures to control hazards to levels permitted in ANSI Z136.1-2000. The LSP is submitted to the LSO for approval prior to beginning operation of the system.

The LSP consists of a description of the laser system, and a Standard Operating Procedure (SOP) which is a description of the operations involving laser use, a description of the laser radiation hazard zone(s) and other hazards (such as electrical or toxic materials) associated with the laser system, and the physical and procedural control measures that have been implemented to limit the hazards.

The Laser Safety Plan should be kept current and resubmitted for approval when significant

Office of Environmental Health & Safety

Class 3b and Class 4 Laser

For the Operation of

5. Will operation of this laser or laser system involve using lasers for Health care, Medical , Or surgical applications to animals or human patients? Yes_____ No_____
If yes , Please indicate what institutional reviews (IACUC, IRB) are required /obtained, and include the procedures(s) for which the laser will be used in the SOP.

Signatures:
Faculty Member:____
Department Chair:_______________________________________

Plan Number ____

LSO Action

Approved

Approved with Provisions (see comments)

Deferred for Revision (see comments)

Disapproved

Comments:____
____
____
____

Laser Safety Officer

Signature:____________________________ Date:_______________________

1.Exclude unnecessary personnel from the laser area during alignment.
2.Use low-power visible lasers for path simulation of higher power visible or invisible lasers whenever possible.
3.Wear laser p

STANDARD OPERATING PROCEDURES (SOP)
FOR CLASS 3B AND CLASS 4 LASERS USERS

1. GENERAL INFORMATION
   - A. Title: ___________________________________
   - B. Location of Work : Bldg _______________ Room: ______________________
   - C. College: ___________________________________
   - D. Laser Safety Contact:__________________________
2. DESCRIPTION OF ACTIVITY:
   - A. Description of Activity including unique equipment (its application) or activity and principal parameters
   - B. Duration: on going _________, limited period ______months
3. IDENTIFICATION OF HAZARDS

   Identification of potential hazards associated with the activity, lasers, and any additional hazards (i.e., toxic gases).

   ____

   ____

Wavelength used: ___________________________________

Power used: ____

Pulse Length: ____

Pulse Repetition Rate: ________________________________

Beam Diameter:______________________________________

Beam Divergence: ___________________________________

Property #: ____

Made in House: ______________________________________

Class: ____

B. Laser Users:_______________________________________

Only those personnel listed below are authorized to use the laser system unsupervised. They have attended the UH laser safety class. Users are responsible for assuring access control policies are followed. Signatures below indicate receipt of training on the specifics of this SOP.

Names

the primary beam does not expose the eye to a level above the maximum permissible exposure for intrabeam exposure. Safety laser glasses are worn at all times during alignment procedures. The laser beam is never to viewed directly. As a precaution, reflective jewelry will be taken off by those handling the laser.

F. Where have the laser warning signs been posted?

Laser warning signs indicate the lasers in the control area, maximum power output, wavelength and hazard class in use in the area. (Warning signs can be obtained from LSO)

G. Laser protective eye wear:

earthquakes and evacuations. Emergency shut off procedures for las