

Summary of Class 3B and Class4 Laser Laboratory Design Guidance

This document is intended to provide general design and engineering guidance for the development and installation of safety controls in laboratories containing Class 3b and class 4 laser systems. This Design Guide does not apply to clinical use lasers. The responsible Principal Laser Users for each Class 3b and class 4 system should incorporate as many of these design features as appropriate/applicable into their laboratories, or work with the **Laser Safety Manager** to achieve the same level of protection with alternate control measures.

1. Illuminated "Laser On" warning sign, posted at each entrance to the laser laboratory, that is activated automatically when the laser is emitting light. In case this is not possible, a manually controlled illumination "laser on" warning sign can be installed (operation needs to be detailed in the SOP). As a last resort option, static **laminated warning signs can be posted in lieu of Laser on Light**.

2. Curtained entryway enclosure [unless a non-defeatable (cannot be bypassed) interlock system tied to beam shutters as described below is installed] composed of fabric sufficiently fire-resistant to prevent combustion when hit by the enclosed laser beam, at the primary entrance to the laser lab; arranged such that, when closed, it fully protects the doorway from stray beams that might otherwise be transmitted out the door –

Curtain specifications: The irradiance of the curtain should be below the damage threshold limit value for the barrier at the installation distance. In the absence of specification of the laser the best option is to install a curtain with high irradiance specifications.

3. Protective eyewear station inside the lab near the main entrance, and within the curtained enclosure (item 2) if so equipped, so that personnel may put on appropriate protective eyewear before proceeding into the laser area

4. Laser-resistant beam shutter that blocks the laser beam, activated:

- a. Manually as needed by laser operators
- b. If any emergency "Beam Off" button (item 6) is depressed
- c. Automatically upon electrical power failure, and
- d. Automatically upon opening any of the interlocks described in item 5.

In case of activation method b-d, the shutter should need to be manually reset before re-opening. In case the laser is equipped with an external interlock input to stop output, this interlock can be used in lieu of the shutter.

5. Interlock on Entry Door(s) wired to activate the shutter described in item 4 (and requiring manual reset once activated) upon opening of the door into the laser use area; those doors without a curtained entryway enclosure (item 2) must be equipped with a non-defeatable interlock system, while doors protected by a curtained enclosure must have either a non-defeatable or a defeatable interlock system (i.e. bypass switch allows trained individuals to temporarily bypass the interlock when entering or exiting). Should an interlock system not be possible it **can be replaced by procedural controls (this needs to be detailed in the SOP)**.

6. Emergency "Beam Off" buttons which activate the beam shutter described in item 4; one button located within curtained entryway area (item 2), another at an easily accessible point within the laboratory

7. Emergency "Power Off" button (for laboratories containing high voltage or high current devices) which cuts electrical service to high power equipment in case of electrical emergency; located at an easily accessible point within the laboratory

References

¹American National Standards Institute, Z136.1-2014 American National Standard for the Safe Use of Lasers (Laser Institute of America, Orlando, 2014).

²Occupational Safety and Health Administration. OSHA Instruction Publication 8-1.7: Guidelines for Laser Safety and Hazard Assessment. August 15, 1991.

³NC State University Environmental Health & Public Safety Center, Design specifications for Class IV laser laboratories. On line: available at: www.ncsu.edu/ehs/laser/index.htm