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LASERSMART® Laser Safety Program

A Safety Primer

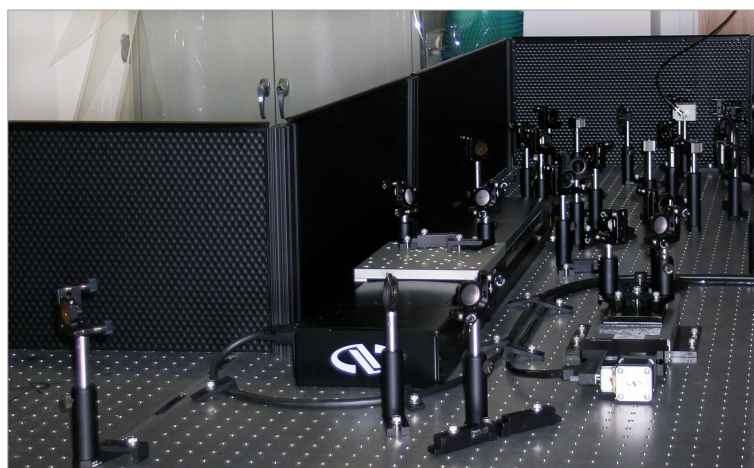
INTRODUCTION

A laser safety program based on ANSI Z136.1 "Safe Use of Lasers" standard is the cornerstone of any organization using Class 3B and 4 laser systems. Management is responsible for ensuring the safe use of lasers owned and operated under its control. The Laser Safety Officer (LSO) administers the overall laser safety program. This paper will mainly address Class 3B and 4 laser safety requirements and it will discuss the provisions of a laser safety program and personnel responsibilities.

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Requirements by Laser Class

Classes 1, 2 and 3R laser systems have no requirements thus a laser safety program is not required.

Classes 1M and 2M laser systems may have requirements but are dependent on whether viewing optics are being used. The Laser Safety Officer would review the laser operation to determine if any controls are necessary.

Class 3B and 4 laser systems have certain requirements which include control measures, laser safety training, appointment of a Laser Safety Officer and engineering controls.

These requirements also apply for Class 1 laser systems with embedded Class 3B or 4 lasers that require beam access by employees during maintenance or service.



Laser Safety Program Provisions

The first and foremost provision for a laser safety program is the appointment of a Laser Safety Officer LSO. The LSO administers the laser safety program and has many duties and responsibilities that will be outlined later in this paper.

Second is the laser safety training of all authorized personnel including operators, users or anyone that the LSO deems would benefit from laser safety training.

Next are application of appropriate laser control measures, incident Investigation including accident and alleged accident reporting to the LSO, and appropriate medical examinations.

Finally the formation of a Laser Safety Committee (when warranted).



Laser Safety Officer (LSO)

The LSO is designated by management and is defined as “one who has authority and responsibility to monitor and enforce the control of laser hazards and effect the knowledgeable evaluation and control of laser hazards.” The LSO has specific duties and responsibilities that are outlined in ANSI Z136.1-2022 “Safe Use of Lasers” standard. Those duties and responsibilities are briefly summarized:

1. Safety Program

The LSO shall establish and maintain adequate policies and procedures for the control of laser hazards.

2. Classification

The LSO shall classify or verify classifications of lasers and laser systems used under the LSO’s jurisdiction.

3. Hazard Evaluation

The LSO shall be responsible for hazard evaluation of laser work areas.

4. Control Measures

The LSO shall be responsible for ensuring that the prescribed control measures are implemented and maintained in effect. This includes avoiding unnecessary or duplicate controls, and recommending or approving substitute or alternate control measures when the primary ones are not feasible or practical.

5. Procedure Approvals

The LSO shall approve Class 3B and Class 4 Standard Operating Procedures.

6. Protective Equipment

The LSO shall recommend or approve protective equipment, such as eyewear and clothing, barriers and screens that may be required to ensure personnel safety. The LSO shall assure that protective equipment is audited periodically to assure proper working order.

7. Signs and Labels

The LSO shall review the wording on area warning signs and equipment labels.

8. Facility and Equipment

The LSO shall review Class 3B and Class 4 laser installations, facilities and laser equipment prior to use.

9. Training

The LSO shall ensure that adequate safety education and training are provided to laser personnel.

10. Medical Examination

The LSO shall effect medical examinations when necessary.

11. Records

The LSO shall ensure that the necessary records required by applicable government regulations are maintained. Other records documenting the maintenance of the safety program, such as training records, audits and SOP approvals, shall be maintained.

12. Audits, Surveys and Inspections

The LSO shall periodically audit or survey by inspection for the presence and functionality of the laser safety features and control measures required for each Class 3B and Class 4 laser or laser system.

13. Accidents

The LSO should develop a plan to respond to notifications or incidents of actual or suspected exposure to potentially harmful laser radiation.

14. Approval of Laser Systems Operations

Approval of a Class 3B or Class 4 laser or laser system for operation shall be given only if the LSO is satisfied that laser hazard control measures are adequate.

Laser Safety Training

Laser safety training is required for the LSO and all users of Class 3B and 4 lasers. Laser safety training should also be made available for all users of Class 1M, 2, 2M and 3R. Topics for Class 3B and 4 user training should include laser fundamentals, laser bioeffects, reflection hazards, non-beam hazards, laser classifications, control measures, employee and management responsibilities and medical examinations. If necessary CPR training should also be included.

In addition to the topics for user training the LSO should also have training on laser terminology, types of lasers, laser outputs, radiometric terms and units, MPE, NHZ, OD and laser hazard analysis calculations.

Once the initial in-depth training is done for the users of Class 3B and 4 lasers periodic training is recommended. For the LSO refresher training is recommended to maintain the appropriate level of laser safety proficiency every 3-5 years or when the ANSI Z136.1 standard is revised.

Control Measures

Control measures are designed to reduce hazardous levels of laser radiation to the eyes and skin. The three types of control measures are engineering, administrative (procedural), and personal protective equipment (PPE).

Engineering

Engineering controls are the preferred method and include items such as interlocks, protective housing, area warning devices, barriers/curtains or enclosures. Anything that is always in place for safety. If engineering con-

trols are not practical, administrative controls and PPE controls should be implemented.

Administrative (procedural)

Administrative controls include items such as standard operating procedures, laser safety training, authorized personnel list or setting up a temporary laser controlled area.

PPE

Personal protective equipment comes in the form of laser eyewear, faceshields and protective clothing such as gloves. Duplicate control measures that accomplish the same task are not necessary. Implementation of control measures will depend on how the laser system is being used – operation, maintenance or service. Operation is normal use with all safety features functional. Maintenance are routine tasks for assuring performance, are usually performed with

written procedures and often does not require beam access. Service is an unusual procedure requiring greater experience and usually requires beam access. control measures need to be specified for operation and maintenance of Class 3B and Class 4 lasers. If personnel are exposed to a Class 4 laser hazard, a SOP must be written and be available at the laser for reference. Only authorized personnel should perform service on lasers. Laser service often requires a higher level of expertise and a greater knowledge of laser hazard evaluation and laser safety practices.



Incident Investigation

A procedure should be in place to report and investigate incidents and accidents. The accident investigation has several components including an accident investigation team, interviewing the victim and any personnel who were present, reviewing training records and visiting the accident scene. Everything should be documented and reported to management. A plan for users should also be established to take action for a suspected injury. The most important item in an action plan is to keep the person calm and immediately seek medical attention.

Medical Examinations

A medical examination should be performed as soon as possible once a suspected injury occurs. If the injury is to the retina then the examination should be performed by an ophthalmologist. Medical exams for a suspected injury should include ocular history, visual acuity, macular function, color vision and a funduscopy exam if deviations are found.

Laser Safety Committee

A Laser Safety Committee may be created to establish policies and practices to help evaluate appropriate control measures and assist with relevant laser safety training topics. Typically larger laser programs will have a Laser Safety Committee. It is recommended that members of a Laser Safety Committee consist of at least one representative from each department or area using lasers.

Personnel Responsibilities

Employees who work with lasers or laser systems and their supervisors have responsibilities for establishing the safe use of lasers within their purview. A Laser Supervisor is a person who is always on scene during laser operations. They are the eyes and ears of the LSO. The Laser Supervisor is responsible for delivering instructions and training. Other responsibilities include but are not limited to making sure adequate controls are in place for safe operation, providing names of authorized personnel to the LSO, notifying LSO of any accidents/incidents, verifying approval of the LSO for new laser operation and being familiar with the laser SOPs. Responsibilities of employees working with lasers include: only working when authorized to do so, complying with safety rules and procedures and notifying the Laser Supervisor or LSO in case of a potential accident or injury. Laser users must take responsibility for applying laser safety in the workplace.



Keys To A Successful Laser Safety Program

The keys to a successful laser safety program include active involvement and support of laser users, effective oversight by the Laser Safety Officer and support from management at all levels.

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