



DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
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and
COMMANDANT OF THE MARINE CORPS
Headquarters
United States Marine Corps
WASHINGTON, DC 20380-1775

OPNAVINST 5100.27A
MCO 5104.1B
CNO N45/CMC (SD)
24 September 2002

OPNAV INSTRUCTION 5100.27A/MARINE CORPS ORDER 5104.1B

From: Chief of Naval Operations
Commandant of the Marine Corps

Subj: NAVY LASER HAZARDS CONTROL PROGRAM

- Ref:
- (a) 21 CFR 1040 Federal Performance Standard for Light Emitting Products (NOTAL)
 - (b) ANSI Z136.1 American National Standard for the Safe Use of Lasers (NOTAL)
 - (c) 29 CFR 1926.54 and 1926.102(b) (2) Safety and Health Construction Standards
 - (d) SECNAVINST 5100.14C Military Exempt Lasers
 - (e) OPNAVINST 5100.23F, chapter 22 Non-Ionizing Radiation
 - (f) OPNAVINST 5100.19D, chapter B9 Radiation Protection
 - (g) BUMEDINST 6470.23 Medical Management of Non-Ionizing Radiation Casualties (NOTAL)
 - (h) NAVSEA Technical Manual E0410-BA-GYD-010, Laser Safety (NOTAL)
 - (i) MIL-STD-882D Department of Defense Standard Practice for System Safety (NOTAL)
 - (j) OPNAVINST 5102.1C Mishap Investigation and Reporting
 - (k) ANSI Z136.2 American National Standard for the Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources (NOTAL)
 - (l) ANSI Z136.3 American National Standard for the Safe Use of Lasers in Health Care Facilities (NOTAL)
 - (m) MIL-HDBK-828A Laser Range Safety (NOTAL)
 - (n) BUMEDINST 6470.19 Laser Safety for Medical Facilities (NOTAL)
 - (o) DoD 4160.21-M-1, Defense Material Disposition and Demilitarization Manual of Oct 1991 (NOTAL)
 - (p) MCO P5102.1A, Marine Corps Ground Mishap Reporting

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- Encl:
- (1) Laser Systems Safety Officer Training Requirements
 - (2) Laser Safety Design Requirement Checklist
 - (3) Requirements and Procedures of the Laser Safety Review Board (LSRB)
 - (4) Guidelines for Submission of a Laser Data Package and Presentation at the LSRB Meeting
 - (5) Military Laser Exemption Notification Format
 - (6) Activity Laser Hazard Control Program
 - (7) General Requirements for Laser Hazard Control
 - (8) Safety Requirements for Military Laser Ranges
 - (9) Laboratory Laser Use and Laser Maintenance Requirements
 - (10) Example Military Exempt Laser Inventory Format
 - (11) Example Non-Military Exempt Class 3b and Class 4 Laser Inventory Format
 - (12) Laser Safety Requirements Summary

1. Purpose. To prescribe Navy and Marine Corps policy and guidance in the identification and control of laser radiation hazards.

2. Cancellation. OPNAVINST 5100.27 and MCO 5104.1A.

3. Scope. The provisions of this directive are mandatory for all Navy and Marine Corps activities. They apply to the design, use, and disposal of all equipment and systems capable of producing laser radiation including laser fiber optics, with the exception of medical and industrial lasers. This document has been coordinated with all members of the Navy Laser Safety Review Board (LSRB).

4. Definitions

a. Administrative Laser Systems Safety Officer (ALSO). One who has successfully completed an administrative lead agent (ALA) and lead Navy technical laboratory (LNTL)-approved ALSO course, such as the one offered by the Naval Occupational Safety and Health and Environmental Training Center (NAVOSHENVTRACEN). The ALSO is equivalent to the previously titled Category II Laser System Safety Officer. See enclosure (1).

b. Laser. An acronym for light amplification by stimulated emission of radiation. Any device that can be made to produce or amplify electromagnetic radiation in the x-ray, ultraviolet,

visible, and infrared or other portions of the spectrum by the process of controlled stimulated emission of photons.

c. Laser Classifications. The four laser hazard classifications that determine the required extent of radiation safety controls. These range from class 1 lasers that are safe for direct beam viewing under most conditions to class 4 lasers that require the strictest of controls. Laser product classification pertains to intended use only. When a laser product is disassembled for maintenance, etc., and protective features removed, the laser classification may change to a more hazardous class. Details concerning laser classification are contained in references (a) and (b). Controls for each class are addressed in this instruction and references (b) through (f).

d. Laser System Safety Officer (LSSO). A generic term used throughout this instruction. It can refer to personnel functioning as an ALSO, technical laser systems safety officer (TLSO), laser safety specialist (LSS) or range laser safety specialist (RLSS).

e. Laser Safety Specialist (LSS). One who has successfully completed the ALA and LNTL-approved course. The TLSO course is a prerequisite for the LSS course. The LSS qualification is an advanced version of the previously titled Category I Laser System Safety Officer. The LSS possesses the technical knowledge required to perform laser hazard evaluations and calculations. See enclosure (1).

f. Military Exempt Lasers. Lasers designed for actual combat, combat training operations, or classified in the interest of national security shall be exempted from the requirements of reference (a). Their design must comply with enclosure (2).

g. Nominal Hazard Zone. The volume of space within which the level of the direct, reflected, or scattered laser radiation may exceed the applicable maximum permissible exposure (MPE) level.

h. Range Laser Safety Officer (RLSO). One who has successfully completed an ALA and LNTL-approved TLSO course, such as the one offered by the NAVOSHENVTRACEN. RLSOs are qualified to perform the duties of an ALSO. Previously certified Category I LSSOs qualify to perform the duties of the

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RLSO. Category I LSSOs require recertification as RLSOs on the anniversary of their certification. Category I LSSOs and RLSOs are not qualified to perform laser or laser range hazard evaluations and calculations. See enclosure (1).

i. Range Laser Safety Specialist (RLSS). One who has successfully completed the ALA and LNTL-approved RLSS course. The TLSO course is a prerequisite for the RLSS course. The RLSS is an advanced version of the previously titled Category I LSSO. The RLSS possesses the technical knowledge required to perform laser range hazard evaluations and calculations required for laser range certification. See enclosure (1).

j. Technical Laser Systems Safety Officer (TLSO). One who has successfully completed an ALA and LNTL approved TLSO course, such as the one offered by the NAVOSHENVTRACEN. TLSOs are qualified to perform the duties of an ALSO and a RLSO. Previously certified Category I LSSOs qualify to perform the duties of the TLSO. Category I LSSOs require recertification as TLSOs on the anniversary of their certification. Category I LSSOs and TLSOs are not qualified to perform laser or laser range hazard evaluations and calculations. See enclosure (1).

All other terms relating to lasers shall be those given in references (a) and (b).

5. Background. The widespread use of lasers in both commercial and military applications has increased the probability of injury from exposure to laser radiation. References (a) through (e) and (g) through (m) provide controls over laser design and operation for protection of personnel and equipment and contain specific information on various laser safety subjects.

6. Policy. Department of the Navy (DON) policy is to identify and control laser radiation hazards early during design and development as a matter of military necessity. DON policy is also to ensure that personnel are not exposed to laser radiation in excess of the MPE throughout the life cycle of laser systems, including research, design, testing, development, evaluation, acquisition, deployment, operation, support, maintenance, demilitarization and disposal.

7. Responsibilities

a. Administrative Lead Agent (ALA). The Bureau of Medicine and Surgery (BUMED) is the ALA within the DON. The ALA shall:

- (1) Act as the primary point of contact and authority within the DON on non-technical laser safety issues.
- (2) Represent the DON in tri-service and other interagency laser safety matters including laser radiation medical surveillance.
- (3) Establish laser safety policy and guidance for the DON. Maintain membership on national and international standards setting boards and committees to ensure currency of Navy policy.
- (4) Perform the duties of secretariat for the Navy LSRB as described in enclosure (3).
- (5) Convene the LSRB on request to evaluate the safety parameters of laser systems during the acquisition process, on major modification, on platform changes and in cases where expert assistance is required in operational testing and deployment.
- (6) Maintain documentation of all Navy and Marine Corps laser systems approved by the LSRB including all military exempt lasers with the rationale for their exemption.
- (7) Report to the Deputy Under Secretary of Defense for Environment and Safety (DUSD (ES)) via Assistant Secretary of the Navy (Installations and Environment) (ASN(I&E)) all Navy initiated requests for disposal and transfer of exempted lasers.
- (8) Advise DUSD (ES) via ASN(I&E) of any substantial changes in laser safety policy affecting exempted lasers.
- (9) Maintain a current database of ALSOs, TLSOs, LSSs, RLSSs, approved instructors, dates of certification, and dates of recertification.
- (10) Establish and publish Navy laser safety design standards and training requirements with input from the LNTL.
- (11) Review for approval (in conjunction with the LNTL) the ALSO, TLSO, LSS, and RLSS training curricula.

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(12) Review personnel and agency qualification (in conjunction with the LNTL) to designate qualified instructors for the ALSO, TLSO, LSS, and RLSS courses.

(13) Maintain a list of current LSRB membership.

b. Technical Lead Agent (TLA). Reference (d) designates the Naval Sea Systems Command (NAVSEASYSKOM) as the TLA for laser safety within the DON. Reference (d) also directs NAVSEASYSKOM to designate the Naval Surface Warfare Center, Dahlgren Division (NSWCDD) Code G71 as the LNTL for laser safety. NAVSEA 00T shall serve as the TLA and, using the technical expertise at NSWCDD Code G71, shall:

(1) Conduct laser safety surveys, measurements, and reviews for all DON lasers and laser installations. Actual services shall be provided by the LNTL on a cost reimbursable basis.

(2) Represent the DON in tri-service and other interagency laser safety matters and support BUMED in laser radiation medical surveillance.

(3) Maintain membership on national and international standards setting boards and committees to ensure currency of Navy policy.

(4) Evaluate laser ranges and target areas via the Naval Surface Warfare Center, Corona Division, Code SE34, PO Box 5000, Corona, CA 92878, DSN 933-4143, commercial (909) 273-4143 or an ALA/LNTL-approved RLSS.

(5) Evaluate laser protective devices via the Naval Air Warfare Center, Aircraft Division, NAWC-ACDIV Vision Laboratory, Code 4.6.1, Patuxent River, MD.

(6) Prepare, publish, and maintain reference (h) for use by the operating forces, systems commands, and shore activities. Reference (h) describes laser safety responsibilities, basic principles of optics and laser radiation, biological effects of laser radiation, laser safety design and procedural requirements, MPE levels of laser radiation, and optical densities required for protection against military laser sources selected by the LSRB. It also contains a nominal list of sources for laser eye protection, hazard distances of military

lasers selected by the LSRB, and laser hazard evaluation procedures.

(7) Review for approval (in conjunction with the ALA) the ALSO, TLSO, LSS, and RLSS training curricula.

(8) Ensure that personnel at the LNTL are LSSs.

c. Laser Safety Review Board (LSRB). The LSRB provides a systems safety review of all DON lasers used in combat, combat training, or classified in the interest of national security and all lasers capable of exceeding class 3a levels, including those used in optical fiber communication systems. This includes systems that are used by other military services and lasers previously registered with the Federal Drug Administration (FDA) for which modifications in design or use are intended. The LSRB does not review lasers planned solely for experimental laboratory, industrial, or medical use. Additionally the LSRB acts as a source of laser safety guidance for any systems regardless of their intended use and can be convened to address issues.

(1) The LSRB consists of a permanent and alternate member from all systems commands; BUMED; Headquarters, USMC (SD); the Naval Safety Center; NAWC Aircrew Division; and NSWCDD. See enclosure (3).

(2) Enclosures (3) and (4) provide procedures used by the LSRB in its deliberations.

(3) If a research and development facility chooses to defer to the LSRB for safety guidance, the facility shall adhere to the decisions and recommendations of the LSRB.

(4) LSRB approval is limited solely to the laser/laser system and those parts of the testing relating to the laser/laser system. LSRB review is not a safety or environmental review for any or all conceivable safety/environmental issues. Final approval for testing should come from the appropriate safety manager, environmental and/or occupational health directorate per local instructions.

d. Commanders of all systems commands, all Navy and Marine Corps program directors and project managers, and research and development activities shall fund and conduct the laser system

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safety program within their cognizant material support areas. They shall:

(1) Apply system safety methods per reference (i) throughout all life cycle phases of laser systems, laser test fixtures and laser facilities for new systems and modification or different applications of an existing system.

(2) Review the purpose of proposed lasers to determine if they shall meet reference (a) or qualify as military exempt. Exempted lasers shall be designed per enclosure (2) and as many of the standards of reference (a) as practical as determined by the LSRB. Standards replacing those in reference (a) shall be as safe. Lasers that are not classified in the interest of national security that are intended primarily for non-combat training and demonstration, industrial operations, scientific investigations, or medical applications shall not be exempted. Any questions in this regard may be addressed to the LNTL.

(3) Grant exemptions from reference (a) and impose enclosure (2) on manufacturers designing military exempt lasers. Procurement or contracting officers shall grant exemptions in writing and ensure that the system is reviewed by the LSRB. The laser exemption format is given in enclosure (5).

(4) Ensure that class 3b and 4 laser systems and all classes of lasers used for combat, combat training, or are classified in the interest of national security are reviewed by the LSRB. Also, provide for LSRB review of all other lasers classified greater than class 3a, except those planned solely for experimental laboratory or medical use. Obtain these reviews before program advancement to the next stage of development, and before test, prototype, or production units are introduced into the fleet. Resubmit systems for LSRB review when new applications or unapproved platforms are planned.

(5) Ensure that the LNTL, NSWCDD Code G71, participates in design reviews, evaluates compliance with enclosure (12), and measures laser output parameters to determine nominal ocular hazard distances (NOHDs) and other safety related parameters of all lasers to be reviewed by the LSRB prior to the review.

(6) Provide to all the LSRB members (list available from the ALA), safety test data, measurements, hazard evaluations of the laser, corrective actions, and other system safety

activities conducted per reference (i) and enclosure (4) of this instruction at least 30 days prior to laser reviews.

(7) Implement the requirements of the LSRB.

(8) Provide laser protective devices for operating and maintenance personnel, and recommend protection for other personnel or material at risk.

(9) Include all necessary laser safety data in laser technical manuals, maintenance requirement cards (MRCs), operational manuals, and training curricula.

(10) Certify laser ranges based on a range certification conducted by a certified RLSS.

f. Navy and Marine Corps commands or activities using class 3b lasers and class 4 lasers, shall:

(1) Establish laser safety organizations per reference (b) and enclosures (6) through (9).

(2) Impose design and operating requirements of this instruction and enclosure (2) on equipment and facilities. Provide adequate warnings, safety training, documentation, and audits for the control of all hazards resulting from the use of lasers at their activities. Ensure all lasers are classified as to hazard and labeled per reference (b).

(3) Appoint the LSSO at that command or activity and forward the LSSO's name, code, and telephone number to the ALA with a copy to the LNTL. The activity commander and LSSO will have control over laser operations at the local activity.

(4) Ensure that only those laser installations and ranges which have been approved by the activity LSSO as safe for specific applications using specific laser systems are allowed to operate and then solely for those applications. Technical assistance is available from the LNTL on a cost reimbursable basis to enable commanding officers and their LSSOs to certify the safety of their laser ranges. The commanding officer is responsible for range certification and use per reference (m).

(5) Use and dispose of military exempt lasers per references (d), (h), and (o). Obtain approval of the ALA prior to disposal. The LSRB may be used to ensure that the system is

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demilitarized per reference (a) or disposed of in a manner that will prevent public access to military exempt technology.

(6) Maintain a current inventory of all military exempt lasers and all class 3b and class 4 lasers as defined in reference (b) for submission to the ALA as requested. A sample format for submission of military exempt laser data is given in enclosure (10). A sample format for submission of non-military exempt class 3b and class 4 data is given in enclosure (11). The LSSO shall keep the inventory of military exempt and class 3b and 4 lasers. Report lost lasers to the ALA with copies to the TLA using the inventory formats given in enclosures (10) and (11).

(7) Immediate consultation shall be obtained with an ophthalmologist or optometrist for personnel with suspected or observed laser exposure. Since early medical intervention may lessen the severity of the damage or subsequent retinal scarring for the laser injury, efforts should be made to have the individual promptly seen by an ophthalmologist or at the ophthalmology department of a hospital on an urgent basis. Notify BUMED (MED-212) by email, fax, message or telephone of suspected or observed laser exposure as soon as possible at commercial (202) 762-3448, DSN 762-3448, fax commercial (202) 762-0931, DSN 762-0931.

(8) Submit a Laser Incident Report for all cases where personnel are inadvertently exposed to laser energy. This report is required for all incidents involving personnel with suspected or observed exposure to Class 3b or Class 4 lasers. The report shall be sent by the LSSO to BUMED within 30 days of the incident and shall include:

(a) List of personnel involved

(b) Estimation of laser exposure received to the eyes or skin as related to the applicable MPE per reference (b)

(c) The examining medical officer's immediate and subsequent medical findings (if applicable).

(d) A detailed account of the laser exposure incident. Include the laser's parameters as applicable: wavelength, energy, pulse repetition frequency, pulse length, beam diameter and divergence.

(e) A detailed account of safety procedures and personal protective equipment used at the time of the laser exposure incident

(f) Lessons learned and actions completed to prevent another laser exposure incident.

(9) Submit a Safety Investigation Report per references (e), (f), and (p) for all incidents that meet the safety investigation thresholds.

(10) Submit a hazard report for any work-related events that could have potentially resulted in a laser exposure such as using defective safety equipment or inadequate standard operating procedures using the Laser Incident Report criteria in Section 7f(8) as applicable.

(11) Obtain LSRB approval for all Class 3b, Class 4 and military exempt lasers. A laser safety requirements summary is provided in enclosure (12).

(12) Coordinate all space directed (above-horizon) emissions with:

North American Aerospace Defense Command
CMOC/J3
Attn: Orbital Safety Officer
Cheyenne Mountain AFS, CO 80914-6020

Laser Clearinghouse
DSN 268-4416, (719) 474-4416

The following parameters shall be reported: operating wavelength, beam-divergence and output power.

g. Per enclosure (12), Navy and Marine Corps regions, commands, or activities having only Class 1, 2, and 3a lasers not used in combat, combat training or classified in the interest of national security (military exempt lasers) are not required to assign a LSSO. However, they shall:

(1) Inform employees to handle these lasers as if they were class 3b lasers capable of causing severe eye damage.

(2) Ensure users read manufacturer literature and labeling.

(3) Report any instances of contact of the laser beam with an eye to the safety office immediately.

8. Reports The reporting requirements contained in this instruction are exempt from reports control per SECNAVINST 5214.2B.



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LASER SYSTEMS SAFETY OFFICER TRAINING REQUIREMENTS

1. General. LSSO shall have satisfactorily completed a Navy Laser Systems Safety Officer course. Commands should contact the ALA/LNTL for the approved formal laser safety course that applies to their situation.

2. Laser Systems Safety Officers (LSSOs). There are four categories of LSSOs - ALSO, TLSO, LSS, and RLSS. Retesting at the LSSO's highest certification level is required to maintain certification for all categories of LSSO every 4 years. If the LSSO fails the recertification examination, the LSSO will have to be re-certified by attending the appropriate course. Personnel should contact either the ALA or LNTL for recertification testing information. Commanding officers should determine which category of LSSO is appropriate for their command considering their mission, types of lasers being used, and size of the laser safety program. LSSO categories and qualification descriptions are as follows:

a. Administrative Laser Safety Officer (ALSO) - formally Category II Laser System Safety Officer (Cat II LSSO). The ALSO must successfully complete an ALA/LNTL approved ALSO course. Current Cat II LSSOs will be grandfathered as an ALSO but must recertify as an ALSO every 4 years. An ALSO is qualified to:

(1) Establish and manage a unit level laser safety program.

(2) Approve, disapprove, or submit for safety approval to higher authority all local laser uses, both portable and fixed.

(3) Instruct employees and supervisors on the safe use of lasers.

(4) Supervise laser operations and maintenance.

(5) Manage laser incident investigations as appropriate. Technical assistance of a LSS or a RLSS is required.

(6) Maintain a laser medical surveillance program.

(7) Maintain an inventory of military-exempt and class 3b and class 4 lasers.

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(8) Post laser warning signs and devices.

(9) Ensure that laser operators have the appropriate knowledge to safely operate their specific lasers (supervisor safety briefs, factory training school, instructional materials, etc.).

(10) Provide safety briefs/pre-mission briefs to laser range users.

(11) Prior to use of a laser range, ensure/confirm that warning signs have been posted, the area is clear of specular reflectors, personnel have required LEP, and all other safety conditions for range laser use outlined in the range regulations or range SOPs are met.

(12) Perform laser eye protection inspections.

b. Technical Laser Safety Officer (TLSO) - formally Category I Laser System Safety Officer (Cat I LSSO). A TLSO must successfully complete an ALA/LNTL approved TLSO course. Current Cat I LSSOs will be grandfathered as TLSOs but must recertify as TLSOs every 4 years. A TLSO is qualified to:

(1) Understand the calculations and measurements of laser safety parameters such as Nominal Ocular Hazard Distances (NOHDs) and required optical densities for laser eyewear.

(2) Train ALSOs using the ALA-approved course curriculum (qualification of TLSOs as instructors requires ALA/LNTL approval).

(3) Understand classification of lasers and laser systems.

(4) Perform the duties of a laboratory, installation, base, research facility, or RLSO as follows:

(a) Establish and manage a base or installation laser range safety program.

(b) Approve/disapprove the use of laser systems on their range that fall within the guidelines of the range certification.

(c) Approve/disapprove any laser operations aboard their range that fall within the guidelines of the range certification.

(d) Perform annual range safety compliance inspections to include:

1. Verification of range boundary warning signs
2. Target conditions
3. Accessibility and condition of ground laser system firing points
4. Other laser safety controls, as appropriate.

(e) Ensure laser ranges under their cognizance are certified/recertified by a RLSS at least every 3 years or when changes to the range fall outside the current certification.

(f) Ensure range regulations/SOPs are provided to commands requesting usage of the laser range.

(g) Review the training plan (to include laser type(s) and proposed employment tactics) of each command requesting access to the laser range to ensure compliance with current laser range certification.

(5) Perform the same duties as an ALSO.

c. Laser Safety Specialist (LSS). The LSS must successfully complete the ALA/LNTL-approved LSS course. A LSS is qualified to:

(1) Perform the calculations and measurements of laser safety parameters such as NOHDs and required optical densities for laser eyewear.

(2) Train ALSOs, TLSOs, RLSOs, and LSSs using the ALA-approved course curriculum. (Qualification of instructors requires ALA/LNTL approval).

(3) Classify lasers and laser systems.

(4) Conduct technical aspects of laser incident investigations.

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(5) Perform the same tasks as a TLSO.

d. Range Laser Safety Specialist (RLSS). A RLSS must successfully complete an ALA/LNTL-approved RLSS course. A RLSS is qualified to:

(1) Conduct laser radiation hazard surveys and evaluations for commanding officer certification.

(2) Perform the calculations and measurements required to certify a laser range.

(3) Train ALSOs and RLSSs using the ALA-approved course curriculum. (Qualification of instructors requires ALA/LNTL approval.)

(4) Conduct technical aspects of laser range incident investigations.

(5) Perform the same tasks as a TLSO.

LASER SAFETY DESIGN REQUIREMENT CHECKLIST

This checklist is intended to help the designer, procuring activity, or personnel responsible for laser safety stay within the laser safety design requirements for military lasers and associated support equipment. There may be requirements where the wording may not precisely apply to the particular situation; therefore, some individual interpretation of the requirements is necessary. Because each individual's interpretation of the requirements may differ, room has been made available to expand upon the answer to each requirement. This checklist should not be used by itself, but in conjunction with other references; e.g., MIL-STD-882,¹ ANSI Z136.1,² and SPAWAR-EE000-BA-GYD-010.³

EQUIPMENT DESCRIPTION

Equipment Name: _____

Model Number: _____

Serial Number: _____

Manufacturer: _____

Address: _____

Responsible Authority: _____

Address: _____

Point of Contact: _____

Address: _____

Phone: _____

Inspector: _____

Date: _____

¹MIL-STD-882C, *Military Standard System Safety Program Requirements*, 1993.

²ANSI Z136.1, *American National Standard for the Safe Use of Lasers*, American National Standard Institute Inc.

³SPAWAR-EE000-BA-GYD-010, *System Safety Checklist for Electrical/Electronic Equipment*, Space and Naval Warfare Systems Command.

SECTION 1 LASER DESIGN REQUIREMENT CHECKLIST

Item	Requirement	Yes/No	Comment
1	Is laser product provided with a tag or label permanently affixed to the device housing?		
1a	Does such a tag or label contain the full name and address of the manufacturer, the laser model, and the place, month, and year of manufacture?		
1b	Is label or tag information not expressed in code?		
2	In lieu of the certification label required by 21 CFR 1010.2; if laser is product exempted under 76EL-01 DoD, is a tag or label permanently affixed to the device housing so that it is readily accessible to view?		
2a	Does such a tag or label contain the following statement? CAUTION This electronic product has been exempted from FDA radiation safety performance standards prescribed in Title 21, Code of Federal Regulations, Chapter I, Subchapter J, under Exemption No. 76EL-01 DoD issued on 26 July 1976. This product should not be used without adequate protective devices or procedures.		
3	Are laser products operational and adjustment controls located so that human exposure to laser radiation in excess of the appropriate MPE is unnecessary for the operation or adjustment of such controls?		
4	Is laser product designed to preclude unintentional laser output (e.g., spontaneous firing)?		
5	Are lasers and associated optics designed so that external secondary beams are not generated unless necessary for the performance of the intended function(s)?		
6	Are focused beams, hot spots, and collateral radiation minimized?		
7	Do lasers employing frequency shifting or harmonic multipliers reduce unnecessary emissions below MPE?		
8	Is the laser system designed to preclude unintentional self-oscillation, mode-locking, double-pulsing, or unwanted modes, when practicable?		
9	If unwanted modes cannot be eliminated, is laser classified as per the worst possible accessible emission level?		
10	Are interlocked protective housings provided to protect personnel from high-voltage sources and unnecessary laser and collateral radiation in excess of the AELs?		
10a	Is aural or visual indication of interlock defeat provided?		
10b	Do interlocks return to their normal operation when access cover or door is returned?		
11	When laser radiation exceeding ANSI AEL for Class 1 is accessible, are visual indicators readily visible while wearing suitable laser protective eyewear?		
12	Do viewing ports and display screens, which allow the operator to view laser radiation, attenuate the radiation to limit personnel exposure to below the appropriate MPE?		

Item	Requirement	Yes/No	Comment
13	Do laser product pointing or viewing optics having a magnifying power exceeding 1.0 include a built-in laser safety filter within the optical train that protects the operator from reflections from specular surfaces or exposures from force-on-force training?		
13a	Is adequate visibility maintained when using laser safety filters?		
13b	Are laser safety filters permanently attached or designed so that the optical train cannot be assembled without the filter?		
13c	Is filter on viewing sight marked to indicate OD & wavelength?		
14	Is there a label marking the output aperture?		
15	<p>Items 15-22 are Class 1, 2, and 3a laser requirements</p> <p>Do laser warning labels for exempted lasers provide clear instructions to the operators, maintainers, and potential bystanders to preclude laser injury?</p>		
16	Do lasers classified as ANSI Class 1, Class 2, or Class 3a meet the design (performance) requirements of 21 CFR Class I, Class II, or Class IIIa, respectively, except where such requirements restrict operational capability or security?		
17	Do lasers classified as ANSI Class 1, Class 2, or Class 3a meet the designation and warning requirements of 21 CFR Class I, Class II, or Class IIIa, respectively, with the exception that the ANSI classification will be displayed in the lower right corner rather than the FDA class?		
18	Are labels permanently affixed or inscribed on such products as to be legible and readily accessible to view when the product is fully assembled for use?		
19	Are warning labels affixed to the laser system housing near the beam exit port and/or fire button when possible in such a manner that viewing the label does not require personnel exposure to laser radiation?		
20	Are Class 2 and Class 3a lasers, as defined by ANSI, provided with a label similar to the examples illustrated in Figure 1?		
20a	Is numerical output information [e.g., wavelength(s) and maximum power output (when unclassified)] located along the lower edge in a smaller font?		
20b	Does the word INVISIBLE or VISIBLE , as appropriate, precede the word RADIATION ?		
20c	When labels may compromise camouflage, are muted colors appropriate to the camouflage paint scheme used?		
20d	Is information classified in the interest of national security omitted from all labels?		
21	<p>When a laser has a defeatable interlock that, when defeated, allows access to Class 3b or Class 4 emission levels, is an additional label that states the following installed on or near the access panel?</p> <p style="text-align: center;">DANGER</p> <p>Laser Radiation When Open and Interlock Defeated, Avoid Eye or Skin Exposure to Direct or Scattered Radiation.</p>		

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Item	Requirement	Yes/No	Comment
22	If non-exempted lasers incorporate military labeling, has alternate labeling been requested by the manufacturer and approved as a variance by the FDA in accordance with 21 CFR 1040 (g) (10)?		
23	<p>Items 23-43 are Class 3b and Class 4 laser design requirements</p> <p>Are Class 3b and Class 4 lasers, as defined by ANSI, provided with a label similar to the examples illustrated in Figure 2?</p>		
23a	Are such labels permanently affixed or inscribed on such products to be legible and readily accessible to view when the product is fully assembled for use?		
23b	Is the label affixed to the laser system housing near the fire button and exit port when the port is remote from the operator in such a manner that viewing the label does not require personnel exposure to laser radiation?		
23c	Does the label use the word DANGER and include the type of laser and the word VISIBLE or INVISIBLE preceding the word RADIATION ?		
23d	<p>Does the label contain an appropriate instructional safety statement or control message for the operator or bystander as applicable?</p> <p>For Class 3b and Class 4 ground target designators:</p> <p>DO NOT AIM AT PERSONNEL OR FLAT GLASS SURFACES</p> <p>For Class 4 lasers that present a diffuse reflection hazard:</p> <p>DO NOT AIM AT PERSONNEL OR FLAT GLASS SURFACES OR TARGETS WITHIN ___ METERS</p> <p>Bystander warning for wavelengths 400 to 1400 nm; Class 3b and Class 4 lasers:</p> <p>DO NOT LOOK INTO PORTHOLE</p> <p>Bystander warning for wavelengths 1400 nm to 1 mm and 180 to 400 nm; Class 3b and Class 4 lasers:</p> <p>DO NOT EXPOSE EYE OR SKIN TO DIRECT OR SPECULARLY REFLECTED BEAMS</p>		
23e	Do DANGER labels have DANGER printed upon a white background with a bright red oval around the word DANGER and contain a red starburst and black lettering?		
23f	When camouflage may be compromised by such warning labels, are appropriate muted colors (i.e., olive drab) used?		
23g	If the information is unclassified, are the ANSI laser hazard classification, wavelength(s), and maximum radiant power or energy added along the lower edge of the label?		
24	Are measures taken to prevent single operator or material error causing unintentional laser output that exceeds ANSI AEL for Class 1?		
25	Are at least two operator actions (one of which shall serve as a laser arming control) required to cause the laser to function?		
26	Is laser output impossible when arming control is in the safe position?		

Item	Requirement	Yes/No	Comment
27	Is the laser fire trigger or switch clearly identified and physically protected to prevent accidental activation (when possible, the switch shall be a guarded positive action type that requires continuous operator intent to operate the laser product and laser output shall cease immediately upon release)?		
28	If the laser is pulsed, is the activation circuitry designed so that continual depression or short-circuiting of the fire control switch will not cause repeated emissions [unless necessary for the performance of intended function(s)]?		
29	If operational considerations preclude the use of a dead-man switch, a toggled switch may be used if adequate design safeguards are provided to prevent long-term inadvertent lasing (e.g., through a watchdog timer and/or system logic switching device). Are these employed?		
30	Does the laser have a permanently installed/ attached exit port cover that prevents access by any part of the body to all laser radiation in excess of ANSI AEL for Class 1?		
30a	Does the cover chosen clearly indicate that it is in place (safe) or open?		
30b	Is the cover designed to withstand repeated laser firings when it is in either position?		
31	Is a readily available remote-control interlock capability incorporated on the laser or auxiliary power supply systems?		
31a	Does the remote control connector have an electrical potential no greater than 130 rms. V between terminals (not essential if the laser is always directed into an interlocked set enclosure for maintenance or service procedures)?		
31b	When the terminals of the connector are not electrically joined, is human access to all laser radiation and collateral radiation in excess of ANSI AEL for Class 1 prevented?		
31c	Is an intentional reset needed to reactivate the system once disconnected?		
32	Is the boresight alignment and retention designed consistent with system mission requirements (considered a safety-critical item)?		
33	Are laser status (emission) indicators (aural or visual or as specified by the procuring agency) provided to inform the operator when the laser is prepared to fire (armed) and when the laser is actually firing?		
33a	If visual indicators are used for operation or maintenance, are they visible during daylight, nighttime, and when viewed through appropriate protective eye wear?		
33b	Are indicators located so that viewing does not require personnel exposure to laser radiation in excess of the ANSI AEL for Class 1?		
34	Is there a means to differentiate between armed and firing (e.g. continuous tone or light is armed and intermittent tone or blinking light is firing)?		
35	If the laser system is installed on an aircraft, is it designed to prevent laser output while the aircraft is not airborne?		
35a	Is an override switch for ground maintenance designed to prevent inadvertent activation?		
36	Does the laser product incorporate controls to optimize positive operator control of beam pointing?		

Item	Requirement	Yes/No	Comment
36a	Does it include a means of ensuring boresight retention and software systems safety?		
37	For systems with automatic target tracking capability, is an automatic disable capacity incorporated to inhibit laser firing if target tracking outside the system specifications occurs or when the laser sight line reaches the gimbal limits or the system mask limit?		
38	If no hardware stops are installed, are at least two independent systems capable of disabling the laser (a provision to override these automatic features during combat is permitted)?		
39	For lasers using a beam scanning technique, if irregularities not normal to the operation and unintended pattern changes increase the hazard potential of the laser product, does it include a feature that terminates or reduces the beam output to ANSI AEL for Class 1 immediately upon the cessation of scanning irregularities (change in either scan velocity or amplitude)?		
40	If a training mode is required for the laser, are provisions made (beam attenuator, expander, diffuser or less-hazardous lasers, TV cameras, etc.) to reduce hazardous emissions to the lowest level consistent with training requirements?		
41	If the laser can be used in both a mission and a training mode, is a visual indication provided to inform the operator and outside observers that the laser is positively in the training mode?		
42	Have the system's Nominal Ocular Hazard Distance (NOHD), skin hazard distance, diffuse reflection hazard determination, protective eye wear requirements, buffer zone requirements, and safety parameters been certified by measurements by NSWCCD (Code G71) and approved by the LSRB?		
43	Do aiming optics employ a reticle that can be viewed under any illumination conditions?		
43a	Does the reticle not impair dark adaptation of observer's eyes?		
43b	Is the reticle calibrated so the operator can determine the proximity of the laser beam to target buffer zones?		

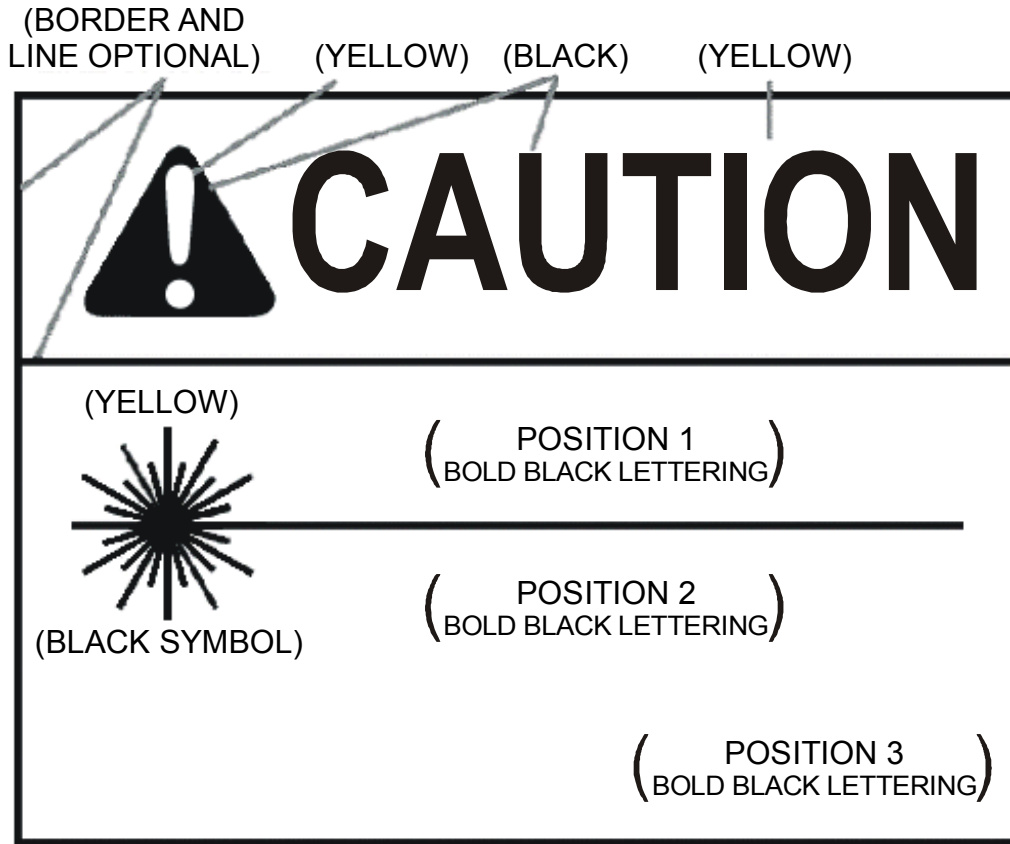


FIGURE 2-1. EXAMPLE OF A CAUTION LABEL. At position 1, precautionary information should be provided, such as “Do not stare into the beam.” At position 2, the type of laser should be provided, such as “Helium Neon,” and at position 3, the hazard class of the laser should be provided. Below the starburst, additional information on the characteristics of the laser should be provided such as laser wavelength and pulse characteristics.

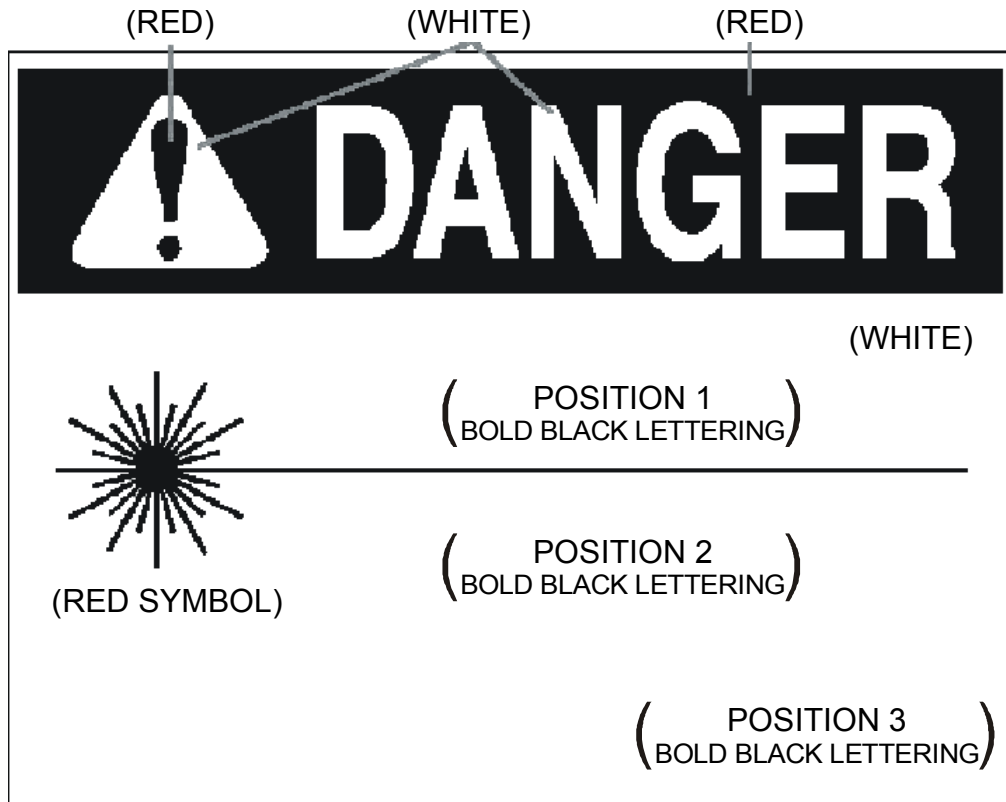


FIGURE 2-2a. EXAMPLE OF DANGER LABEL. Starburst is red; letters are black. Precautions including the NOHD would be placed above the tail of the starburst at position 1. The type of laser, including output power, pulse characteristics, and whether the output is visible or invisible, is placed below the tail of the starburst at position 2. The ANSI classification is placed in the lower right hand corner at position 3.

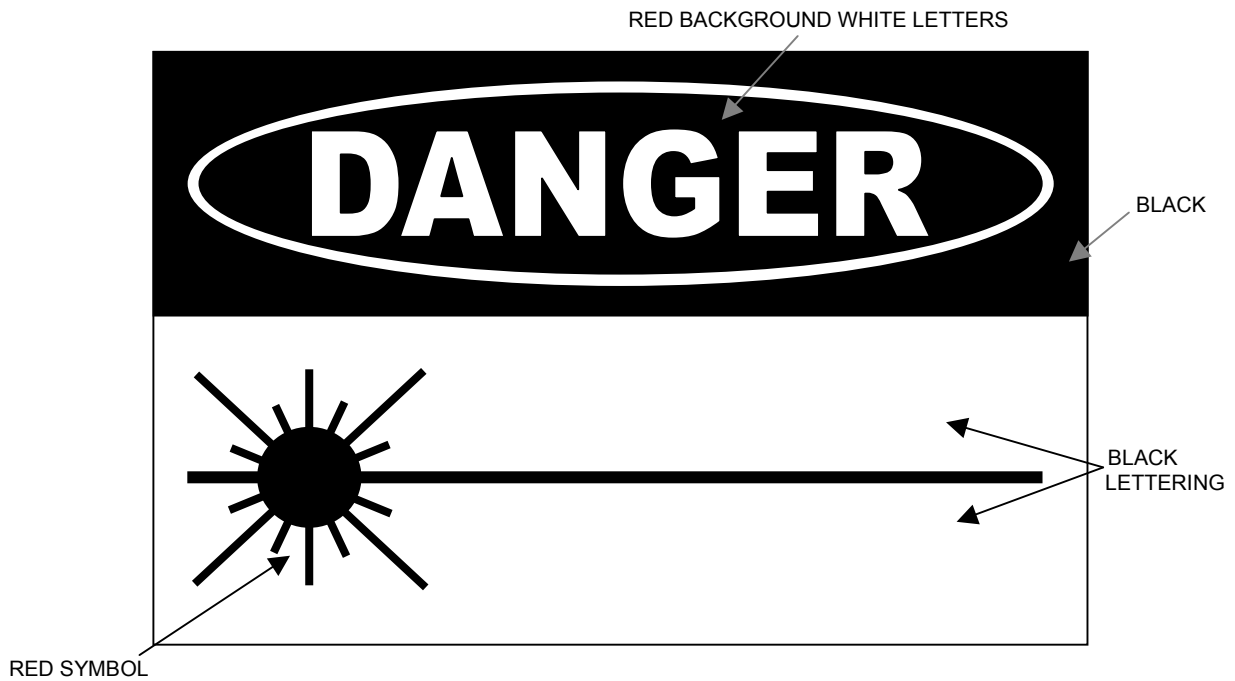


FIGURE 2-2b. EXAMPLE OF AN ALTERNATE DANGER LABEL. Starburst is red; letters are black. Precautions including the NOHD would be placed above the tail of the starburst. The type of laser, including output power or pulse characteristics, placed below the starburst. If the output of the laser is invisible, the word “invisible” should be included below the tail of the starburst. The ANSI classification is placed in the lower right hand corner.

SECTION 2 SUPPORT EQUIPMENT DESIGN REQUIREMENT CHECKLIST

Item	Requirement	Yes/No	Comment
1	Items 1-7 are applicable to all classes of laser support equipment If the laser support equipment is military exempt, is it used solely in support of exempted lasers?		
2	Is the laser support equipment designed to ensure that laser radiation emitted during maintenance or service is no greater than the ANSI AEL for Class 1 and that collateral radiation is not in excess of applicable limits, when practicable?		
3	Does the equipment confine the laser radiation within an opaque enclosure?		
4	Is the enclosure interlocked to prevent exposure to levels in excess of the ANSI AEL for Class 1 when the enclosure is removed?		
5	Is the enclosure provided with the appropriate exterior warning indicators and labels?		
6	Have other associated hazards been addressed and controlled by suitable engineering programs per MIL-STD-882 (NOTAL), MIL-STD-2036 (NOTAL), and SPAWARINST 4110.1 (NOTAL)?		
7	Are adequate instructions as to safe techniques and personnel protective means included in all technical manuals and plainly marked on the laser product when potentially hazardous areas are accessible?		
8	Items 8-13 are applicable to Class 1, Class 2, and Class 3a laser support equipment requirements Does the laser support equipment meet the design (performance) requirements of 21 CFR Class I, Class II, or Class IIIa, respectively, except where such requirements restrict operational capability or security?		
9	Does the laser support equipment meet designation and warning requirements of 21 CFR Class I, Class II, or Class IIIa, respectively, with the exception that the ANSI classification will be displayed in the lower right corner rather than the FDA class?		
10	Are labels permanently affixed or inscribed on such products as to be legible and readily accessible to view when the product is fully assembled for use?		
11	Are warning labels affixed to the housing in such a manner that viewing the label does not require personnel exposure to laser radiation?		
11a	Is numerical output information [e.g., wavelength(s) and maximum power output (when unclassified)] located along the lower edge in a smaller font?		
11b	Does the word INVISIBLE or VISIBLE , as appropriate, precede the word RADIATION ?		
11c	When labels may compromise camouflage, are muted colors appropriate to the camouflage paint scheme used?		
11d	Is information classified in the interest of national security omitted from labels?		

Item	Requirement	Yes/No	Comment
12	<p>When a laser has a defeatable interlock that, when defeated, allows access to Class 3b or Class 4 emission levels, is an additional label that states the following installed on or near the access panel?</p> <p style="text-align: center;">DANGER</p> <p>Laser Radiation When Open and Interlock Defeated, Avoid Eye or Skin Exposure to Direct or Scattered Radiation.</p>		
13	Does non-exempted support equipment incorporate military labeling when alternate labeling has been requested by the manufacturer and approved as a variance by the FDA in accordance with 21 CFR 1040 (g)(10)?		
14	<p>Items 14-24 are Class 3b and Class 4 laser support equipment requirements</p> <p>Does the laser system test equipment for boresight and laser performance testing attenuate the beam to limit personnel exposure to below AEL for ANSI Class 1?</p>		
15	Is the laser system test equipment for boresight and laser performance testing interlocked to the laser to prevent inadvertent laser operation outside the enclosure if the test equipment is not used in a closed installation?		
16	Is an access interlock switch interfaced with ANSI Class 3b and Class 4 laser systems under test such that inadvertent removal of test sets or poor connection will terminate or limit the laser output to the ANSI AEL for Class 1 or Class 2, if applicable?		
17	Is a warning system activated immediately prior to operation of the laser and remain activated until the laser output has been reduced to the ANSI AEL for Class 1 or Class 2, if applicable?		
17a	Is the warning system designed not to attract personnel attention in such a manner as to create a potential hazard?		
18	Does all support equipment for laser hardware that could directly activate the laser preferably incorporate a positive action (dead-man) switch that must be activated when laser firing is desired?		
19	When a dead-man switch is not incorporated, is an emergency cutoff switch provided that allows emergency cutoff of laser output in excess of ANSI AEL for Class 1 or Class 2, as appropriate?		
19a	Is the switch readily accessible from the operator's position and permit one-step operation?		
20	Is a key-lock master switch provided to prevent unauthorized activation of any test facility component used to supply power directly to the laser that is necessary for its operation?		
21	Is the laser beam terminated by a beam stop that is diffuse (i.e., has a low value of reflectance at the laser wavelength)?		
21a	Is such a beam stop fire resistant and unable to emit toxic or carcinogenic fumes when exposed to the laser(s) for which it was designed?		
21b	Is the beam stop marked for the type(s) and power level(s) of laser(s) for which it is procured?		

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Item	Requirement	Yes/No	Comment
22	Are appropriate control measures for the protection of personnel (e.g., appropriate exhaust ventilation) provided where toxic gases cannot be prevented, such as firebrick, which contains beryllium compounds?		
23	Are Class 3b and Class 4 laser support equipment, as defined by ANSI, provided with a label similar to the examples illustrated in Figure 2?		
23a	Are such labels permanently affixed or inscribed on such products to be legible and readily accessible to view when the product is fully assembled for use?		
23b	Is the label affixed to the laser system housing near the fire button and exit port when the port is remote from the operator in such a manner that viewing the label does not require personnel exposure to laser radiation?		
23c	Does the label use the word DANGER and include the type of laser and the word VISIBLE or INVISIBLE preceding the word RADIATION ?		
23d	<p>Does the label contain an appropriate instructional safety statement or control message for the operator or bystander as applicable?</p> <p>For Class 3b and Class 4 ground target designators: DO NOT AIM AT PERSONNEL OR FLAT GLASS SURFACES</p> <p>For Class 4 laser support equipment that present a diffuse reflection hazard: DO NOT AIM AT PERSONNEL OR FLAT GLASS SURFACES OR TARGETS WITHIN ___ METERS</p> <p>Bystander warning for wavelengths 400 to 1400 nm; Class 3b and Class 4 laser support equipment DO NOT LOOK INTO PORTHOLE</p> <p>Bystander warning for wavelengths 1400 nm to 1 mm and 180 to 400 nm; Class 3b and Class 4 laser support equipment: DO NOT EXPOSE EYE OR SKIN TO DIRECT OR SPECULARLY REFLECTED BEAMS</p>		
23e	Do DANGER labels have DANGER printed upon a white background with a bright red oval around the word DANGER and contain a red starburst and black lettering?		
23f	When camouflage may be compromised by such warning labels, are appropriate muted colors (i.e., olive drab) used?		
23g	If the information is unclassified, are the ANSI laser hazard classification, wavelength(s), and maximum radiant power or energy added along the lower edge of the label?		
24	Is laser output impossible when arming control is in the safe position?		

SECTION 3 LASER FACILITY DESIGN REQUIREMENT CHECKLIST

Item	Requirement	Yes/No	Comment
1	Is support equipment designed such that laser radiation emitted during maintenance or service is no greater than the ANSI AEL for Class 1 and collateral radiation is not in excess of applicable limits when practicable?		
2	Can support equipment confine the laser radiation within an enclosure that is adequately interlocked to prevent levels in excess of ANSI AEL for Class 1 when the enclosure is removed?		
2a	Is the enclosure provided with appropriate exterior warning indicators and labels?		
3	Have other associated hazards been addressed and controlled by suitable engineering programs per MIL-STD-882, MIL-STD-2036, SPAWARINST 4110.1, and ANSI Z136.1?		
4	Are adequate instructions as to safe techniques and personnel protective means included in all technical references (manuals) and plainly marked on the laser product when potentially hazardous areas are accessible?		
5	Is facility designed for limited personnel access?		
6	Is facility a closed installation for Class 3b and Class 4 lasers?		
7	Are reasonably high illumination levels at the work areas attainable to overcome any reduction in visual performance primarily due to the use of laser protective eyewear?		
8	When practicable, is facility designed so that no personnel protective equipment is required?		
9	When the hands or other parts of the body are likely to be exposed to potentially hazardous levels, are protective coverings provided?		
10	Are all personnel working in laser facility provided with suitable personal protective clothing and equipment?		
11	Does laser protective eyewear provide complete protection for the individual's field-of-view and is it marked with the Optical Density (OD) at the specific laser wavelengths?		
12	Is protective eyewear selected according to the laser equipment used at that facility?		
13	Is protective eyewear selected suitable for individuals requiring corrective lenses as well as for uncorrected vision?		
14	Items 14-26 are applicable to Class 3b and Class 4 laser facility requirements Is a laser warning sign displayed on all entry points or doors to the facility?		
14a	Do warning signs use the word DANGER and include the type of laser (VISIBLE and/or INVISIBLE), as appropriate, and precede the word RADIATION ?		
14b	Do such warning signs contain an appropriate instructional statement; e.g., KNOCK BEFORE ENTERING or KNOCK AND WAIT ?		
15	Are access interlock switches interfaced with ANSI Class 3b and Class 4 laser systems under test such that inadvertent entry into facility will terminate or limit the laser output to the ANSI AEL for Class 1 or Class 2?		

Item	Requirement	Yes/No	Comment
15a	Are these interlock systems such that inadvertent removal or poor connection of test sets will terminate or limit laser output to ANSI AEL Class 1 or Class 2?		
16	Is a warning system, external to the facility, activated immediately prior to operation of the laser and remain activated until laser output has been reduced to the ANSI AEL for Class 1 or Class 2, if applicable?		
17	Does the facility incorporate operation switches and beam stops per checklist items 24 through 31 for support equipment requirements?		
18	Does test equipment for boresight and laser performance enclose the beam to limit personnel exposure to below class 1 AEL?		
19	Is test equipment interlocked to laser to prevent inadvertent laser operation outside the enclosure if test is not in a closed installation?		
20	Where the laser is not otherwise supported rigidly, is a mechanical fixture provided to rigidly attach the laser in a fixed position during testing and maintenance?		
21	Are location & orientation of test fixtures such that exposure of personnel to direct beam is minimized?		
22	Are the interior surfaces of the facility painted with a finish that has a low value of reflectance at the laser wavelength(s) and that will diffuse the laser beam while maintaining an acceptable ambient illumination?		
23	Are additional safety features to warn personnel to clear the beam path area and a low-power visible laser subsystem for pre-alignment provided?		
24	If the facility is designed for very high-power continuous wave (CW) or pulsed lasers, does it have a means to enclose the entire beam path within the facility?		
24a	Is the enclosure designed to withstand the direct beam?		
25	If necessary, are remote-control firing and television monitoring provided?		
26	Have associated hazards been controlled? Has ANSI Z136.1 requirements been incorporated?		

SECTION 4 LASER PROTECTIVE EYEWEAR CHECKLIST

Item	Requirement	Yes/No	Comment
1	Does laser protective eyewear protect against the worst possible exposure situation?		
2	Does it allow the best compromise between protection and high visibility?		
3	Is protective eyewear fully compatible with normal corrective lenses (spectacles)?		
4	Does protective eyewear take into consideration all wavelengths emitted from the laser?		
5	Is wavelength range for which eyewear is designed clearly marked on the protective eyewear?		
6	Is the Optical Density (OD) at each wavelength for which the protective eyewear is designed clearly marked on the eyewear?		
7	Is the damage threshold intensity of the protective eyewear in excess of the maximum intensity emitted by the laser?		
8	Is the protective eyewear durable for the anticipated environment and lifetime?		
9	Has protective eyewear with curved lenses been considered?		

REQUIREMENTS AND PROCEDURES OF THE
LASER SAFETY REVIEW BOARD (LSRB)

1. Laser Safety Review Board. The LSRB ensures that laser safety criteria are incorporated in all DON laser systems. The LSRB membership shall elect a chairperson every 2 years. The chairperson should be a qualified LSS. The administrative lead agent (ALA) shall provide the secretariat and administrative support.
2. Scope. The LSRB shall review all lasers and laser systems used for combat and combat training and classified in the interest of national security (not designed solely for laboratory or medical use) to determine the potential hazards of the laser, especially with respect to laser radiation, during all phases of development, use, maintenance, transportation, storage and disposal. All lasers capable of exceeding the accessible exposure limits (AELs) or MPE limits for a class 3a laser require review by the LSRB, with the exception of lasers used solely in industrial or medical setting.
3. Composition. The LSRB is an independent authority on laser safety. All systems commands, the BUMED, Marine Corps Headquarters (SD), the Naval Safety Center, the TLA, and the LNTL shall provide a permanent and alternate member to the LSRB. The names, telephone numbers of the members, and their security clearances shall be forwarded to the ALA. Members of the LSRB shall be TLSOs. There should be at least one RLSS on the LSRB and the technical laboratory members shall be LSSs. The ALA shall provide a permanent secretary for the LSRB. Personnel assigned as members of the LSRB shall be experienced in laser safety and have no responsibility for the development or effectiveness of the item under review. Designated LSRB members should seek assistance in technical documentation review either from the program manager, the laser system contractor, or the LNTL when needed.
4. Responsibilities. The LSRB shall review the hazardous aspects of each laser system presented to ensure that all safety requirements including design features, procedures, precautions and training are included in the laser installation and documentation. Having established the degree of safety incorporated in the laser system, the LSRB, through the chairperson, renders a judgment as to the safety of the system and presents its requirements and recommendations regarding the advancement of the system to the next stage of the acquisition

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life cycle. The LSRB members shall have a current SECRET clearance for classified meetings. Specific responsibilities are as follows:

a. The Chairperson of the LSRB shall:

(1) Convene the LSRB as deemed necessary when requested by the program office or systems command.

(2) Preside at LSRB meetings.

(3) Ensure implementation of LSRB functions.

(4) Issue LSRB requirements and recommendations to the responsible agent for each laser presented within 30 days of the meeting.

b. The secretariat shall:

(1) Schedule LSRB meetings as required.

(2) Provide administrative support to the LSRB.

(3) Issue reports generated by the LSRB.

(4) Maintain the official files of the LSRB.

(5) Maintain an archive or record all e-mail messages/ message traffic resulting from informal LSRB meetings.

c. Members shall:

(1) Review technical documents presented prior to LSRB meetings.

(2) Render an independent appraisal of the laser safety aspects along with a recommendation concerning safety approval of the item under review. All phases of the life cycle are to be considered, with emphasis given to the life cycle phases of specific concern to the command represented.

(3) Ensure that the LSRB secretariat receives copies of all e-mail messages resulting from informal LSRB meetings.

d. All Navy and Marine Corps program/project managers and commanding officers of facilities with lasers shall:

(1) Submit all items within the scope of this instruction for LSRB review at appropriate times throughout the entire life cycle (concept and technology development, system development and demonstration, production and deployment, and sustainment and disposal).

(2) Submit a document package per enclosure (4), for review at least 30 days prior to the established meeting date. The document package shall be sent to each member of the LSRB. LSRB addresses will be supplied by the ALA or LNTL upon request and can be found on the Navy Laser Safety Website at <http://www.navylasersafety.com>.

(3) Ensure that the LNTL is provided with funding and the required device information to perform the laser safety survey, measurements, and review of the laser system at least 2 weeks prior to the LSRB meeting.

5. Scheduling. Schedule the review of a proposed system well in advance of any use of the laser or laser system so that LSRB requirements and recommendations can be implemented prior to use. The evaluation shall be scheduled with the LNTL at least 30 days prior to the desired date of the evaluation.

GUIDELINES FOR SUBMISSION OF A LASER DATA PACKAGE
AND PRESENTATION AT THE LSRB MEETING

1. The content of the document package and the presentation is mainly affected by three considerations:

- a. The complexity of the item to be presented
- b. The point in the life cycle in which the review is conducted
- c. Security classification of the material.

2. The following guidelines will assist in preparing for the LSRB. Advice and assistance may be sought from the secretariat of the LSRB and the LNTL. Systems reviewed later in their life cycle and more complex systems typically require a voluminous data package for review.

- a. Documentation should be sufficiently complete and detailed to allow a meaningful review of all laser safety aspects by LSRB members prior to the presentation. Information shall not exceed the SECRET level. It should completely describe:

- (1) The design of the system. A full set of design drawings is not desired, but rather documents such as assembly drawings, firing circuits, or other sketches that would indicate or assist in describing the system. Emphasis should be put on components, hardware, software, and human factors affecting safety.

- (2) The operation of the system. A concise but thorough description of the intended use of the system including maintenance, boresight determination and error, boresight retention, calculated and measured tracking and aiming accuracy, storage areas, use environment, handling equipment, laser platform, platform stability, performance sequence, disposal methods, etc.

- (3) Safety features of the system. Describe the system safety program plan and its results including a list of all types and scopes of hazard analyses. Observations made during development, test, and evaluation of the system and support equipment (such as protective devices) that bear on laser safety should be presented. All safety devices incorporated in the

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system as well as precautionary measures to be invoked, such as the methods of beam stop control and establishment of cutouts, are to be identified. Also required is a description of the extent to which the system meets the requirements of applicable standards, specifications and safety controls.

(4) Documentation and training support for the system. Include laser custodian information, laser identification/type designation, contract number, national stock number and location(s) and number of lasers. Verify that the required publication and training programs are being or have been developed to assure the safe operation, training, handling, transportation, storage, and disposal of the laser system.

b. The major theme of the presentation should be the system safety program results with design and operation being covered in depth. While a definite time limit cannot be established, it is suggested that the presentation be limited to 2 hours. The persons most familiar with the system safety program and the design and operation of the system should give the presentation. NSWCCD Code G71 will present their findings at the LSRB meeting provided their evaluation has been completed. Contact the LSRB chairperson or secretariat regarding audiovisual requirements at least 2 weeks prior to the meeting. Attendees at the presentation should include the program manager, the system engineer, the LSSO, and a user of the system from the fleet, squadron, etc.

c. The LNTL or its designee will perform all measurements for hazard determination to be presented to the LSRB.

(1) For laser systems and certification of laser firing ranges, contact the NSWCCD, Code G71, Dahlgren, VA, 22448, DSN 249-1060, commercial (540) 653-1060. Range surveys are also conducted by the Naval Warfare Assessment Station, (NWAS), Code SE34, PO Box 5000, Corona, CA 92878, DSN 933-5172, commercial (909) 273-5172 and can be conducted by an ALA/LNTL designated RLSS.

(2) For medical and industrial laser operations, contact the Navy Environmental Health Center, 2510 Walmer Avenue, Norfolk, VA 23513-2617, DSN 253-5584, commercial (757) 462-5584.

(3) For laser eyewear device evaluation, contact the Naval Air Warfare Center, NAWC-ACDIV Vision Laboratory, Code

OPNAVINST 5100.27A

MCO 5104.1B

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4.6T, Patuxent River, MD, 20670, DSN 342-8480/8805, commercial
(301) 342-8480/8805.

MILITARY LASER EXEMPTION NOTIFICATION FORMAT

1. The following statement shall be used to notify the contractor that a laser product is exempt from 21 CFR, Chapter 1, Subchapter J.

"In accordance with Exemption No. 76EL-01DoD to the Department of Defense on July 26, 1976, by the Commissioner of Food and Drugs, the following electronic product is exempted from Food and Drug Administration (FDA) radiation safety performance standards prescribed in the Code of Federal Regulations, Title 21, Chapter 1, Subchapter J.

Laser Type/Medium_____

Manufacturer_____

Number of Lasers_____

National Stock Number (if available)_____

Local Stock Number_____

Reason for exemption:(Check all that apply)

Combat_____

Combat Training_____

Classified_____

2. The manufacturer shall label laser products exempted under 76EL-01DoD as follows:

CAUTION

This electronic product has been exempted from FDA radiation safety performance standards prescribed in the Code of Federal Regulations, Title 21, Chapter 1, Subchapter J, under exemption No. 76EL-01DoD issued on July 26, 1976. Use this product only with adequate protective devices or procedures.

or with other wording approved by the LSRB. In special circumstances, other wording approved by the ALA or LNTL can be used to notify personnel that the laser shall not be sold or distributed to the public without demilitarization or disposal of the laser system.

3. The contractor must comply with LSRB requirements and recommendations as stipulated in the contract, identify those design requirements of 21 CFR Part 1040 which cannot be incorporated in the system, and provide rationale for noncompliance with each requirement.

ACTIVITY LASER HAZARD CONTROL PROGRAM

1. Introduction. All activities that use class 3b or class 4 lasers or systems incorporating any class 3b or class 4 lasers, shall establish a formal laser hazard control program. Medical facilities shall follow guidance as set forth by references (e), (f), (g), (l), and (n). A formal hazard control program is not required for class 1, 2, and 3a lasers and for optical fiber communication systems using lasers that comply with the design and operational procedures of ANSI Z136.2. (NOTE: Activities shall caution individuals using class 3a lasers labeled with a danger label that these devices are capable of causing severe eye damage).

2. Program Requirements. The activity laser hazard control program shall include as a minimum:

a. Regulations. Establish an appropriate laser safety organization and issue laser safety regulations or SOPs for indoor and outdoor operations and maintenance.

b. Laser Systems Safety Officer. The commanding officer shall designate an individual by name and code as the LSSO. Responsibilities and duties of the LSSO shall be formally documented to ensure that lasers are operated safely per this instruction. The LSSO shall have direct access to the commanding officer and have the authority to suspend, restrict, or terminate the operation of a laser or laser system. The LSSO shall be trained to perform his/her assigned duties. A detailed breakdown of ALSO, TLSO, LSS, and RLSS qualifications is provided in enclosure (1). Retesting at the LSSO's highest level is required to maintain certification for all categories of LSSO every 4 years. If the LSSO fails the exam, the LSSO must be re-certified via the appropriate course.

c. Medical Laser Safety Officer. Medical laser safety officers are a special case and must comply with reference (n) and do not have to be ALSO, TLSO, LSS, or RLSS certified, but must receive training that meets the requirements of reference (l). The commanding officer shall designate, in writing, an individual by name and code as the medical laser safety officer. Responsibilities and duties shall be formally documented to ensure that lasers are operated safely per this instruction. The medical laser safety officer shall have direct access to the commanding officer and have the authority to suspend, restrict, or terminate the operation of a laser or laser system. If the activity is a purely medical facility, then the designated medical laser safety officer can serve as the activity LSSO.

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d. Laser Classification and Labeling. Each laser requires safety approval from the LSSO. Each laser also requires classification and labeling prior to use per enclosure (2). Some class 1 or class 2 lasers, when broken down for maintenance, allow class 3b or class 4 radiation levels to be accessible and are treated as class 3b or class 4 under those conditions. For example, if radiation at the level of class 3b or class 4 is accessible when a class 1 laser housing is removed, then procedures and labeling of the laser and maintenance manuals must warn of this condition. When a Class 1 laser has a defeatable interlock that, when defeated, allows access to Class 3b or Class 4 emission levels, an additional label is needed on or near the access panel that states the following:

DANGER

**Laser Radiation When Open and Interlock Defeated,
Avoid Eye or Skin Exposure to Direct or Scattered Radiation.**

e. Protective Equipment. Commands using lasers shall provide appropriate laser protective equipment i.e., eyewear, clothing, barriers, screens, etc., to employees. Laser eye protection shall provide optical densities, at the operating wavelength(s), under both unaided and optically aided viewing to ensure that the applicable MPE is not exceeded. Eyewear shall be labeled with the wavelength and optical densities or appropriate LEP code and inspected periodically (at least annually) to ensure its integrity. Any degradation such as cracks or bleaching shall result in replacement. Notify all concerned personnel of any defective eyewear.

f. Safety Evaluations, Inspections and Surveys. Laser facilities and ranges (other than medical facilities) shall receive local laser safety compliance inspections annually by a TLSO, LSS, or RLSS. Medical facilities shall be inspected on setup and per references (e), (f), (l), and (n). NSWCDD, NAWC Corona, or an ALA/LNTL-designated RLSS shall perform complete laser radiation hazard surveys and evaluations on laser ranges to determine the degree of laser radiation hazard and to recommend proper controls. These hazard surveys and evaluations shall be performed on all new laser ranges and on portions of a certified range that want to incorporate changes. These ranges must be re-certified every 3 years.

g. Medical Surveillance Program. A laser medical surveillance program shall be established and maintained per reference (g).

h. Laser Inventory. Maintain and submit all necessary records required by reference (d) and other government regulations to the ALA and TLA. Maintain a list of all class 3b, 4 and military exempt lasers and their locations at the activity. A current laser inventory and all records for lost or disposed laser systems shall be maintained for submission to the ALA and TLA per paragraph 7f(6) of this instruction. Inventory sheets are included in enclosures (10) and (11) of this instruction.

i. Warning Devices and Signs. Post laser warning devices and signs at appropriate locations to protect unsuspecting personnel from laser radiation per reference (b) and enclosures (2) and (6) through (9).

j. Documented Safety Duties for Laser Supervisors. Document the safety responsibilities of personnel who supervise laser operations. Those duties may include such functions as safety planning for the installation of laser systems, providing and enforcing operational procedures, ensuring employees receive appropriate training, investigating incidents, and logging class 3b and 4 laser firings.

k. Operator Training and Certification. Conduct a command laser safety training program per enclosures (8) and (9). Prior to assignment, employees who work with lasers shall receive formal training in methods of hazard control. Establish procedures to qualify a laser operator or maintenance technician worker. Procedures shall include periodic review to ensure that personnel are complying with requirements such as annual refresher training. Per reference (c), construction workers shall have proof of their training readily available or in their possession.

l. Emergency Provisions. The emergency procedures (to include emergency shutdown procedures, laser hazard information, and points of contact) shall be posted at each laser installation in a location that is safely accessible to personnel rendering emergency aid. Emergency medical technicians and firefighters shall be trained in laser hazards and controls. This may require liaison with outside (contractor) personnel.

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m. Laser Safety Committee. Establish a local laser safety committee to assist in discharging the above responsibilities if warranted by the magnitude of the potential hazards in local operations.

n. Laser Mishap Investigation and Reporting. Ensure prompt medical attention is given to laser injuries. Investigate and report laser mishaps per references (e) and (g). Mishaps afloat and when in port shall be reported per references (f) and (g). Copies of reports shall be sent to the Naval Safety Center, BUMED (212), HQMC Safety Division, the LNTL and the ALA per references (e), (f), and (j). Ensure corrective actions are taken to prevent similar mishaps.

o. Disposal of Military Exempt Lasers. Obtain ALA approval prior to disposal of military exempt lasers. Ensure excess military exempt lasers are not sold or donated outside the Department of the Defense (DoD) unless they have been brought into compliance with 21 CFR and received FDA registration and ALA approval.

GENERAL REQUIREMENTS FOR LASER HAZARD CONTROL

1. General

a. All military exempt and class 3b and 4 lasers, used in airborne, at sea or military ground operations shall be reviewed and approved by the Navy LSRB prior to their use to determine compliance with regulations, laser hazard data, and recommended eye protection.

b. Only authorized personnel shall operate class 3b and 4 laser devices.

c. Every laser operation or series of laser firings using class 3b or class 4 laser systems shall be logged for all outdoor range operations by the hosting range and operational unit, and for all laboratory firings/tests by laboratory personnel. Documentation for each on/off cycle of the laser is required for systems with nominal ocular hazard distances in excess of 150 meters. All exercises/operations using systems with nominal ocular hazard distances of 150 meters or less can be logged using the start/stop time of the exercise regardless of the number of firings. An example log is provided in Figure 7-3. Logs shall be maintained for at least 3 years.

d. Personnel shall not be allowed access to a controlled lasing area (for example, laboratory, laser range, or laser-firing area) unless they have had a hazard brief, the appropriate supervisory approval has been obtained, and protective measures have been taken.

e. Prior to laser operations, the operator shall ensure that the laser target area, laser hazard zone and/or laboratory is clear of personnel or that any personnel within the area are aware of imminent laser operation and are properly protected against laser hazards.

f. Unprotected personnel shall not be exposed to laser radiation in excess of the MPE levels in reference (b).

(1) Personnel shall use personal protective equipment specifically designed for protection against the laser system when engineering or procedural controls are inadequate to eliminate radiation levels in excess of the MPE.

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(2) Laser protective eyewear shall be marked with optical density values and wavelength for which protection is afforded or the appropriate LEP code and issued to involved personnel. The eyewear shall provide a snug fit and shall not be used if it does not pass inspection. Before each use and during periodic (at least annual) LSSO safety inspections, laser eye protection shall be inspected for:

(a) Pitting, crazing, scratching, cracking, bleaching, etc.

(b) Mechanical integrity and leaks.

(3) Optical systems such as lenses, telescopes, etc., may increase the hazard to the eye and may be used only when appropriate interlocks or filters are used to attenuate the radiation levels below the MPE. Contact NSWCDD Code G71 for assistance in calculations and evaluation of optical systems and filters.

g. All laser systems used in combat, combat training, or used on ranges shall have boresight verification per LSRB recommendations.

2. Warning signs. Laser range and building warning signs as shown in Figures 7-1 and 7-2 of this enclosure shall be posted at the entrances to laser ranges, buildings, or rooms.

3. Non-beam hazards

a. Commands shall make provision to protect against hazardous by-products that may result from the reaction of laser radiation, especially ultraviolet laser radiation, with air, plastics, and other substances such as ozone and skin irritants.

b. Personnel shall not be exposed to microwave power densities in excess of those specified in reference (e).

c. Appropriate precautions shall be taken per environment safety and health policy and guidance for the non-beam hazards in laser installations that may arise from the following:

(1) Electricity

(2) Cryogenics

- (3) Compressed gas
- (4) Toxic materials
- (5) Noise
- (6) Arc of filament lamps
- (7) Targets that may shatter
- (8) Ionizing radiation
- (9) Incoherent optical and ultraviolet radiation from laser discharge tubes, flash lamps or laser/target plasmas
- (10) Charged capacitors
- (11) Flash lamp or capacitor explosion.

d. Proper personnel protection and procedures shall be provided in the use of cryogenics. Compressed gas bottles shall be secured. All laser discharge tubes or flash lamps, the laser target, capacitors, and all elements of the optical training that may shatter shall be contained. All incidental radiation shall be adequately shielded. Toxic materials shall be so marked and adequately controlled. Smoking, eating, or drinking in laser work areas shall be prohibited.

4. Training for Operators/Maintainers

a. All personnel in areas using class 3b or class 4 lasers and all personnel using class 3a force-on-force lasers shall receive annual training about the potential hazard associated with accidental exposure to this form of radiation. In particular, the extraordinary danger of eye damage due to focusing and absorption by the eyes shall be emphasized. Class 3b and class 4 lasers may also cause skin damage or damage to material by fire or explosion due to rapid heating from a focused beam. Initial safety training and refresher training shall be appropriate to the operation. Topics for training shall include but not be limited to:

(1) What a laser is and what its associated beam and non-beam hazards are. Include a discussion of the hazards associated with class 3a laser devices with danger labels.

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(2) A review of standard operating procedures for each of the command-used laser systems specifications and hazard data for command-used laser devices and specific control measures to minimize risk of accidental exposure to personnel

(3) Manufacturer's operating information, LSRB safety information and any other safety requirements (to include non-beam hazards) or procedures specific to the command-used system(s)

(4) Type of eye protection to be worn and any other personal protective equipment required

(5) Review of medical surveillance program/requirements (reference (g))

(6) Review of local range SOP/regulations (for operators and laser range personnel)

(7) Review of maintenance precautions/requirements (for personnel conducting maintenance on laser devices that potentially exposes them or other personnel to the beam).

b. Other topics should be at the discretion of the supervisor in conjunction with the LSSO and may consist of information interchange seminars between laser users on the usefulness of existing safety procedures, information on recently discovered hazards/hazardous materials or suggestions for new safety devices.

5. Laser, Associated Support Equipment, and Facilities Design Safety Features

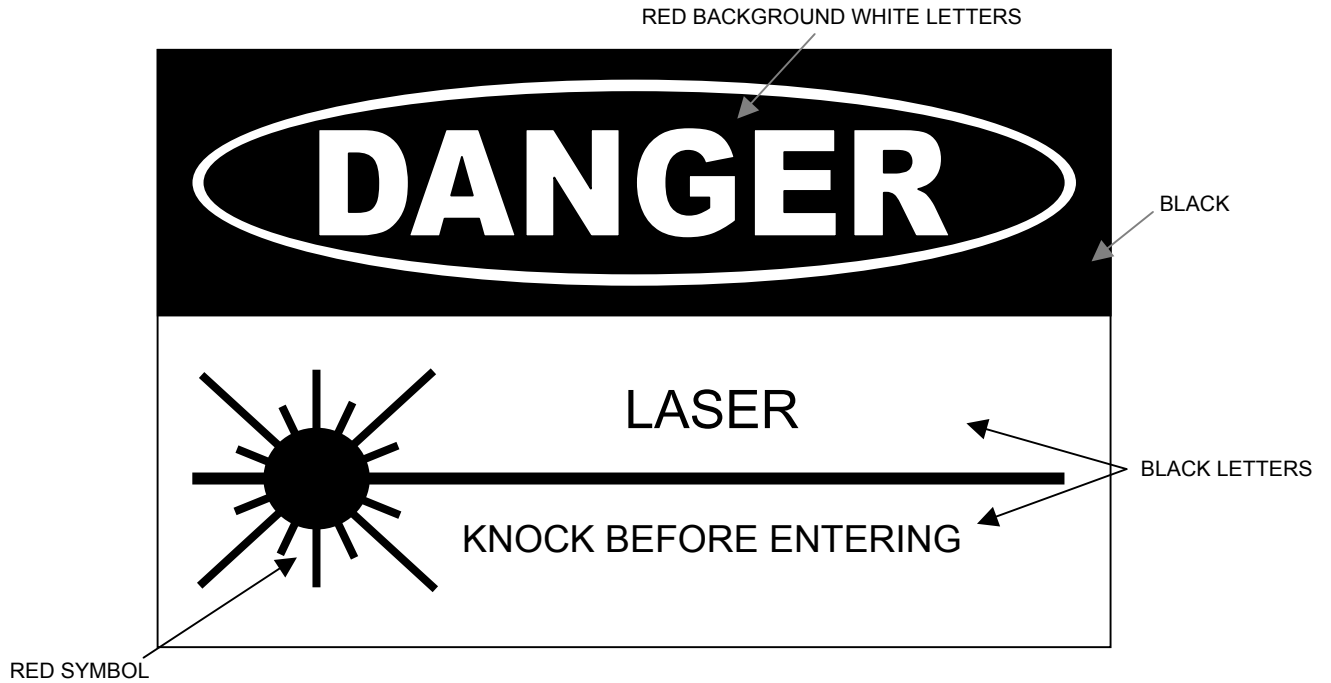
a. Each laser, regardless of class, must have protective housings to prevent excessive optical and X-radiation. All laser protective housings must be interlocked. When the protective housing containing the laser beam is not interlocked or has defeatable interlocks, a warning sign must be provided stating "CAUTION or DANGER" (depending on the internal laser classification) with additional information concerning the hazard involved.

b. Other laser safety requirements include an emission indicator that provides a visible signal when viewed through protective goggles, or an audible warning signal during laser radiation emission in excess of the maximum allowable safe

limits. The warning signal must not cause personnel to inadvertently look into the laser beam or reflected radiation from the target. Personnel should be made aware of the meaning of this emission indicator. Each class 3b or class 4 laser must be supplied with a beam attenuator capable of preventing unsafe levels of laser radiation. This attenuator shall be used whenever possible especially during maintenance. Class 3b and class 4 laser area access should be interlocked with the laser system to prevent accidental radiation of personnel. Where this is not feasible, a nominal hazard zone (NHZ) may be defined and enforced instead of interlocking entrances to general laser work areas. The use of electric eyes and warning alarms is recommended to assist in policing the perimeter of the NHZ.

c. All non-exempted lasers to be used by the military or on a military installation must be designed and built per reference (a). Associated support equipment, facilities, protective eyewear, and operating and maintenance procedures shall be per reference (b), manufacturer instructions, and LSRB requirements, where applicable. All optical fiber communication systems shall include the requirements of reference (k). All military exempt lasers, their associated support equipment, facilities, and eye protection shall be designed and constructed per enclosure (2).

6. Construction Lasers. In addition to the general rules, follow Occupational Safety and Health Administration (OSHA) regulations of reference (c) for lasers used in construction.



Laser Maintenance Area Warning Sign is available on website

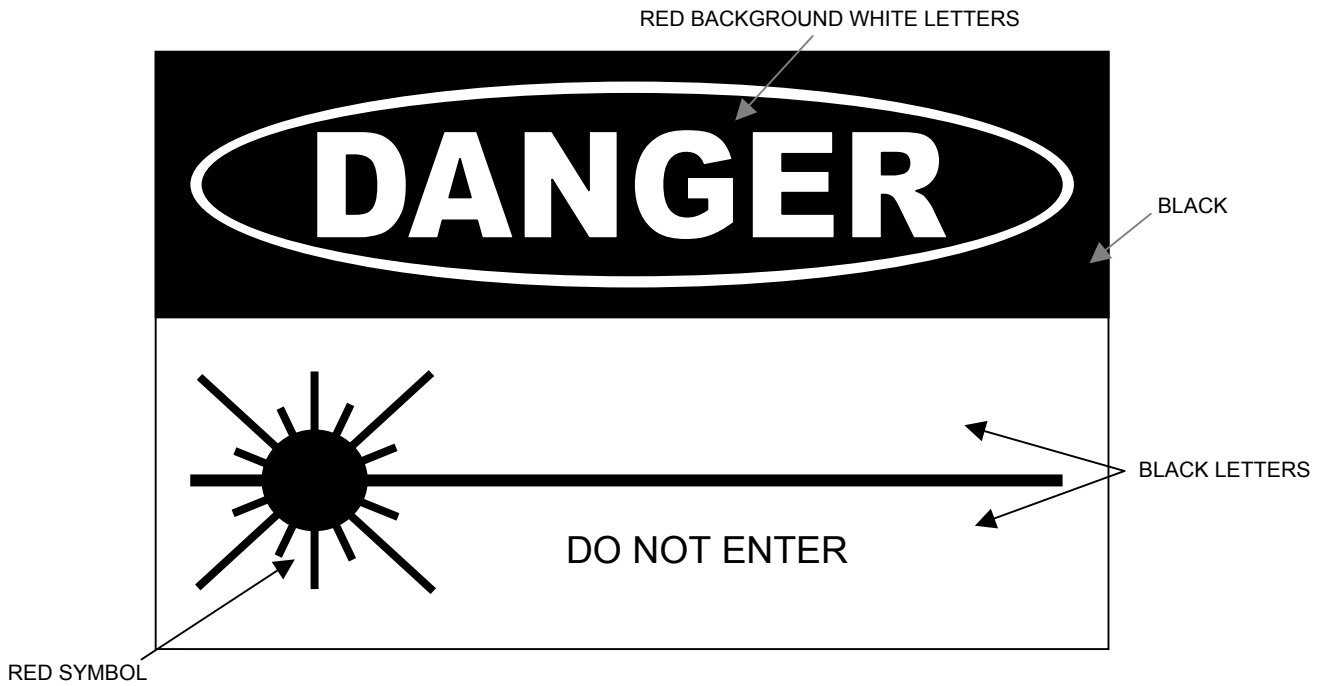
<http://forms.daps.mil>

Go to Registration Process and follow the instructions. Need UIC and password to order the form.

Stock Number: 0118LF1148900

Form Number: NAVSEA 1995/80

Figure 7-1. Laser Maintenance Area Warning Sign



Laser Range Warning Sign is available on website

<http://forms.daps.mil>

Go to Registration Process and follow the instructions. Need UIC and password to order the form.

Stock Number: 0118LF0201100

Form Number: NAVSEA 1995/17

Figure 7-2. Laser Range Warning Sign

LASER FIRING LOG

Command _____
Range _____
Date _____
System _____
User _____
Mission Commander _____

Firing #	Time	Target Location	Firing Position/Heading
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Figure 7-3. Sample Laser Firing Log.

SAFETY REQUIREMENTS FOR MILITARY LASER RANGES

1. Introduction. All laser device/system control requirements of enclosures (6) and (7) apply in addition to the following range-specific information.

2. General

a. Range safety personnel with laser safety training and experience appropriate to the exercise or operation shall be present during all laser operations.

b. When ground positions are designating for aircraft, an aircraft exclusion zone shall be established that is centered on the ground-lasing position to the target. The exclusion zone shall be, at a minimum, a 20-degree safety cone around the firing point extending back from the target to the firing point.

c. During airborne laser operations, personnel in the lasing aircraft must wear laser protective eyewear in single aircraft laser scenarios if there is a possibility of retro-reflectors or other flat specular reflectors in the target area and within one-half the NOHD from the aircraft.

d. All personnel in other aircraft that must fly in the restricted airspace through a defined laser hazard area must have suitable laser protective eyewear in place during transit of that hazard area.

e. Class 3b and 4 laser target designators and rangefinders shall not be activated until a designated target has been acquired optically or through a recognized tracking system (e.g., FLIR or radar). Laser target locators and illuminators require special care during use to avoid illuminating non-target areas.

f. No class 3b or 4 lasers shall be directed above the horizon unless coordinated with the Federal Aviation Administration and affected DoD components, including North American Aerospace Defense Command, CMOC/J3, Attn: Orbital Safety Officer, Cheyenne Mountain AFS, CO 80914-6020, Laser Clearinghouse, DSN 268-4416, (719) 474-4416

g. All ship-towed targets shall adhere to requirements of reference (m).

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3. Range Certification. NSWCCD, NAWC Corona, or a RLSS shall perform complete laser radiation hazard surveys and evaluations of laser ranges to determine the degree of laser radiation hazard and to recommend proper controls. These hazard surveys and evaluations shall be performed on all new laser ranges, whenever changes to the range will exceed the current certification and every 3 years. Additionally, laser facilities and laser ranges shall receive local safety compliance inspections annually by an LSSO, LSS or RLSS.

4. Range Regulations/Range Standard Operating Procedures (SOP). Every laser range complex shall develop and maintain a range SOP. The SOP should contain, at a minimum, a description of the authorized firing points, run-in headings, altitude restrictions, firing fans, and other control measures and restrictions for the range.

5. Laser Systems Safety Officer/Command Responsibilities

a. The RLSO for the hosting range complex shall:

(1) Ensure requesting unit has a certified LSSO coordinating the test/training operation.

(2) Provide the local range regulations/standard operating procedures to the LSSO of the requesting unit.

(3) Review proposed laser range operations plan or test plan to ensure compliance with current certification and local regulations and standard operating procedures.

(4) Ensure a laser safety inspection of the range is completed prior to its use (e.g. signs are posted, area is clear of specular reflectors, LEP is available, etc.).

b. The command requesting use of the laser range shall:

(1) Review host range complex range regulations/SOP.

(2) Provide a range use operations plan/test plan to RLSO that includes:

(a) Name and date of qualification of the command LSSO

(b) Laser devices to be used

- (c) Laser device firing points
 - (d) Targets to be used /target areas to be used
 - (e) Ground personnel locations (indicating those requiring laser eye protection)
 - (f) Laser eye protection to be used (if applicable)
 - (g) Aircraft run-in headings (if applicable)
 - (h) Ship heading for towed target operations
 - (i) Laser mode(s)/tactics to be employed (e.g. force-on-force, designation, rangefinding, offset lasing, high altitude release bomb (HARB), etc)
 - (j) Hazard areas to be cleared of non-operating personnel (roadblock locations, if required)
 - (k) Types of surveillance to be used to ensure a clear range
 - (l) Radio frequencies (or channels) and standardized terminology for communication where appropriate.
- (3) Ensure all personnel involved in operations receive an appropriate pre-mission brief to include:
- (a) Authorized tactics, firing positions, firing fans, and aircraft run-in headings (as appropriate)
 - (b) Drawings, photographs, descriptions or grid points of authorized targets
 - (c) Communication procedures that include specific frequencies (or channels), controlling authorities, and standardized terminology
 - (d) Acquisition, identification, and tracking procedures for targets are established prior to laser activation
 - (e) Missile/ordnance mode of operation (as appropriate for live fire operations)

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(f) Requirements for beam termination

(g) Control measures to minimize the risk of unauthorized personnel or aircraft entering the range area

(h) Type of eye protection to be worn

(i) Potential hazards posed by the laser system (e.g. phantom targeting and backscatter); the target area, maintenance area, etc.; types of warning signs to be posted; and specific procedures to avoid these hazards (as appropriate).

(4) Ensure appropriate laser eye protection is provided to all personnel within the laser hazard zone.

(5) Ensure all aspects of the range regulations/standard operating procedures are adhered to during the operation/exercise/test.

(6) Ensure only tactics, authorized within the scope of the range certification and only LSRB-approved laser systems are used for the operation/exercise/test.

LABORATORY LASER USE AND LASER MAINTENANCE REQUIREMENTS

1. General. Use of all class 3b and 4 lasers in laboratory settings and all lasers requiring maintenance that could expose personnel to laser radiation exceeding the MPE shall adhere to the requirements in enclosures (6) and (7). Additionally, the requirements of this enclosure apply:

2. Laboratory Use of Lasers

a. At least two people should be present at all times when operating lasers with accessible high voltage. Where the operation allows, follow a countdown procedure to minimize unnecessary potential exposure by forewarning personnel to take necessary protection from the radiation by donning protective equipment or moving out of the danger area. Operators shall verify that conditions are safe before proceeding.

b. Lasers and laser beams should be contained within suitably controlled equipment, spaces, or ranges. Laser beams emitted by an unenclosed system must be terminated at the end of the useful beam path if the exposure level is greater than the MPE. The backstop shall be of material that absorbs or blocks the particular wavelength and shall not burn or emit toxic products when irradiated. Special care in absorbing and containing the laser radiation must be taken especially when the laser is emitting energy in the ultraviolet or infrared portions of the spectrum where the observer might receive damage to the eyes without being aware of the direct radiation or its reflection. Laser controls must be located to prevent operator exposure to unsafe levels of radiation. Care should be taken to block all extraneous radiation such as that reflected or refracted from materials used to interact with laser beams.

c. Reflecting surfaces that are not specifically approved for use in the exercise, such as mirrors, bottles, windows, shiny metal, plexiglas, or other surfaces that have a high coefficient of specular reflection shall be eliminated from the beam path or shall be faced and surrounded with diffuse absorbing substances to absorb the energy prior to operations. Personnel working in the vicinity of laser beams shall not wear jewelry such as watches or tie clasps that could act as specular reflectors.

d. Laboratory laser operating procedures shall be posted outside each entrance to the area where lasers are operated or

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maintained. The SOP shall address, where feasible, each laser used therein by name and shall include:

- (1) Lasers authorized
- (2) Normal operations
- (3) Entry restrictions
- (4) Types of protective eyewear required (wavelength and optical density)
- (5) Startup safety requirements (types and locations of beam stops, countdown procedures, area clearance procedures, warning lights activated outside and inside the area, etc.)
- (6) Emergency shutdown procedures for fire, rescue, and security personnel in case of emergency. (NOTE: This information should be on file with fire, rescue, and security personnel as well.)
- (7) Conditions for unattended operation if permitted by the LSSO
- (8) Exact hazardous material allowed and conditions of permitted use, including personal protective equipment, fire fighting equipment, ventilation requirements, storage containers, allowed amounts, and emergency response procedures
- (9) Specific prohibitions, e.g., no smoking or flames, no eating or drinking
- (10) Requirement for two persons to be present during operations, for emergency assistance where deemed necessary by the LSSO.

3. Laser Maintenance. Some lasers classified as class 1, 2, or 3a may contain an embedded class 3b or class 4 laser that changes the class when attenuator, panels, or protective housings are removed for servicing and maintenance.

a. General

(1) During maintenance, hazardous levels of laser radiation shall be confined to prevent exposure of unprotected personnel. Such confinement may consist of:

(a) An enclosure which safely confines the radiation with no specular (mirror-like) reflections, and is adequately interlocked or guarded and provided with exterior warning lights (as appropriate) and warning signs similar to Figure 7-1

(b) An output lens cap that safely confines the radiation

(c) When removal of panels, attenuator, or protective housings; overriding of protective housing interlocks; or entry into the nominal hazard zone (NHZ) leads to accessible laser radiation exceeding the MPE, a temporary laser controlled area with the signs and precautions appropriate to the class 3b or 4 laser shall be devised. Additionally, a cap shall be provided to cover the laser radiation exit port to prevent undesired or unauthorized external radiation.

(2) Maintenance protocols shall be posted in and around the controlled area where personnel could be exposed to laser radiation in excess of the MPE. Maintenance protocols shall include:

(a) Laser device and its hazard parameters

(b) Authorized protective eye wear

(c) Procedures in the event of laser over exposure (to include points of contacts with verified phone numbers and procedures to shut down the laser).

(3) All safety devices including cutouts and eyewear shall be checked and maintained on a regular basis.

(4) All electrical safety precautions of references (e) and (f), the Electronics Installation and Maintenance Book (EIMB), NAVSEA 0967-LP-000-0100 (NOTAL), OSHA standards 29 CFR Parts 1910, 1915, and 1926; and SPAWARINST 5100.9 (NOTAL) shall be strictly enforced, especially in the use of grounding rods to discharge capacitors and the two-person rule.

(5) Precautions and protection shall be provided against noise in excess of 85 dB(A), radiation, hazardous material such as some lens coatings and connector compounds, toxic or inert gases, cryogenics, mechanical hazards, radiation through viewing ports, and other recognized hazards.

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b. Optical Fiber Communication Systems (OFCS). OFCS that contain lasers shall be considered enclosed systems as long as the laser remains fully attached to the cable and the radiation output is confined within a cable system. Any laser fiber optic connector that is not inside a secured equipment enclosure shall be labeled with the caution or danger appropriate to the laser and shall require a tool to be disconnected. While no tool for disconnection is required when the connector is located inside a secured equipment enclosure, caution or danger signs appropriate to the class of the laser shall be located near the connectors and shall be visible when the enclosure is open. The local LSSO shall ensure that the following general rules are applied when servicing OFCSs:

- (1) Detachable components and connectors are labeled.
- (2) Continuity with an optical test set has been verified.
- (3) Employees' laser hazard training includes the potential hazards associated with looking into broken or disconnected cables.

EXAMPLE MILITARY EXEMPT LASER INVENTORY FORMAT

From:
To: Chief, Bureau of Medicine and Surgery (Med 212)

Subj: EXEMPT LASER INVENTORY REPORT FOR FY

INSTRUCTIONS: Lasers should be grouped. All lasers included on one entry sheet must have identical characteristics, i.e., same contract number, same NSN, same function, same delivery date, same disposal date, etc. Only their serial numbers and plant account numbers can be different. List beginning and ending serial/plat account numbers for continuous sequences. If classified, any field except contract number may be left blank for reasons of national security.

System Name _____ AN/ _____ Type _____ Class _____

Manufacturer _____

Approved by LSRB? (Y)___ (N)___ If no, explain _____

Exemption Qualification (Check applicable spaces)

Combat _____ Training _____ Classified _____

Optional: Contract Number _____
Total to date in this contract _____
NSN _____
Serial Numbers _____

STATUS

Subtotals should add up to quantity possessed. Disposed lasers shall be maintained as a separate part of the inventory. Lost lasers shall be reported immediately to the ALA.

Quantity Possessed _____

Subtotals: In use _____ Repair _____ Storage _____ Await Disposal _____

Laser Location(s) _____

Custodian Name(s) _____ Phone _____

Signature(s) _____

Copy to:
Naval Sea Systems Command 00T
NSWCDD Code G71

EXAMPLE NON-MILITARY EXEMPT CLASS 3b AND CLASS 4 LASER
INVENTORY FORMAT

From:

To: Chief, Bureau of Medicine and Surgery (Med 212)

Subj: CLASS 3b AND CLASS 4 LASER INVENTORY REPORT FOR FY

Laser Name _____ Type _____

Wavelength _____ Max. Output _____ Pulse or CW _____ Class _____

Program/User/Custodian Name(s) _____ Phone _____

Location(s) _____

Use(s) _____

Optional: Manufacturer _____

Contract Number _____

NSN _____

Plant Account Numbers _____

Serial Number(s) _____

Signature(s) _____

Copy to:
Naval Sea Systems Command 00T
NSWCDD Code G71

LASER SAFETY REQUIREMENTS SUMMARY

<u>LASER SAFETY REQUIREMENTS SUMMARY</u>	All lasers used in combat, combat training and classified in the interest of national security					Other lasers							
	X - shall O - should	1	2	3a	3b	4	All Locations			Lab/Test		Range	
							1	2	3a	3b	4	3b	4
OPNAVINST 5100.23E(CH1) ¹ (ashore)/ OPNAVINST 5100.19D ¹ (afloat)/ This instruction	X	X	X	X	X	X	X	X	X	X	X	X	X
SECNAVINST 5100.14C	X	X	X	X	X								
LSRB APPROVAL	X	X	X	X	X	O	O	O	O	O	X	X	
21 CFR (FDA REGISTERED)						X	X	X	X	X	X	X	
Laser Safety Design Requirement Checklist Adapted from MIL-STD-1425A	X	X	X	X	X								
MAINTAIN INVENTORY	X	X	X	X	X				X	X	X	X	
APPROVAL FOR DISPOSAL FROM ALA	X	X	X	X	X								
T&E BY NSWCDD Code G71	X	X	X	X	X	O	O	O	O	O	X	X	
CONTRACTING OFFICER NOTIFY CONTRACTOR CONCERNING EXEMPTION AND LABELING PER ENCL (3)	X	X	X	X	X								
CAUTION LABEL PER ANSI Z136.1		X	X										
DANGER LABEL PER ANSI Z136.1			X	X	X								
CAUTION LABEL PER 21 CFR							X	X					
DANGER LABEL PER 21 CFR								X	X	X	X	X	
<u>USER TRAINING</u>													
Read manufacturer literature and labeling	X	X	X	X	X	X	X	X	X	X	X	X	
Formal safety specific training with demo/military video				X	X				X	X	X	X	
Laser Systems Safety Officer ASSIGNED & TRAINED	X	X	X	X	X				X	X	X	X	
LASER INST PROMULGATED				X	X				X	X	X	X	
MIL-HDBK-828	X	X	X	X	X						X	X	

¹Required for Navy Commands

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RESTRICTIONS

Class 1 Lasers	Class 2 Lasers	Class 3a Lasers with CAUTION LABEL	Class 3a Lasers with DANGER LABEL
None during operation.	Caution label and prohibition against staring into beam.	Caution label on laser and prohibition against staring into beam or viewing with optical aids.	Danger label on laser and prohibition against looking into beam or viewing with optical aids.

RESTRICTIONS AT LABORATORIES AND TEST FACILITIES

Class 3b Lasers	Class 4 Lasers
Danger sign and warning light or other indicator on laser and lab entrance.	Same as Class 3b and ALSO:
Elimination of all unnecessary specular reflectors from beam path and insertion of beam stops around all remaining specular reflectors.	Removal of hazardous diffuse reflectors.
Beam stops or enclosed beam path.	Nonflammable stops where necessary.
Safety procedures for operations and maintenance posted or on hand.	Skin protection when necessary.
Flat paint on surfaces (walls, etc.)	Special precautions for high energy.
Adequate illumination appropriate to the task.	
Protective eyewear at the specific wavelength and proper OD. (Unnecessary and unsafe use of protective eyewear shall be avoided.)	
Protective eyewear training, inspection, and replacement program in place.	
Entrance interlocks if beam is not enclosed (interlocks may insert beam stop over exit port of laser or disconnect power to laser.), or if other electrical/chemical/physical hazards exist to entrants. Other techniques such as door locks (doors should open for emergency egress and during power loss.), entry alarms, entrance sentries, beam controls, etc., when approved by the Laser Systems Safety Officer.	
Emergency shutdown switch per MIL-STD-1425.	
Keylock master switch.	
See section 7 of ANSI Z136.1, paragraph 5 and Appendix A of MIL-STD-1425A for more details.	

RESTRICTIONS AT RANGES³

Class 3b Lasers	Class 4 Lasers
Laser safety survey and certification by trained and qualified Laser Systems Safety Officer or the LNTL	Same as class 3b and:
Survey and recertification required every three years or after each range modification.	Elimination of hazardous diffuse reflectors
Danger warning signs posted per MIL- STD-1425A and this instruction at range boundaries and entrances and at the laser.	Nonflammable absorbing beam stops where necessary.
Barricades with Danger warning signs on access roads to target area.	Skin protection where necessary.
Target area, buffer zone, and nonreflecting beam stop assigned for each specific laser.	Special precautions for high energy sources.
Target area and targets free of specular reflectors.	
Protective eyewear at the specific wavelengths and proper OD on personnel in restricted areas (target area and buffer zone). ⁴	
Protective eyewear training, inspection, and replacement program in place.	
Range Log of time, date, and heading of laser firing.	
Adequate area surveillance.	
Two-way communications between range safety officer, laser personnel, and restricted area personnel.	
Target in cross hairs on laser sight before lasing.	
Lasing ceased when directed by range control or if unable to keep target in sights.	
A clearing pass by aircraft before lasing or other suitable means, as determined by the range Laser Systems Safety Officer, of insuring range is clear.	
Restricted airspace and time established where laser radiation is potentially in flight path of aircraft or satellites.	
Safe flight profile of allowed laser operating altitudes, headings, and distances from target maintained by lasing aircraft.	
Area of restriction established for other aircraft within the nominal hazard distance of the laser.	
Personnel in other aircraft in the restricted cone around the laser line of sight having eye protection of proper OD and wavelength.	
For ground laser operations, assurance that all unprotected personnel are behind the laser and are not within the buffer zone anywhere along the laser line of sight, or between the laser and target or between target and backstop.	
Presence of range safety personnel with appropriate laser safety training and experience during all laser operations.	
All range personnel involved with laser operations trained in laser safety.	
A medical surveillance program in place per BUMEDINST 6470.23 series.	
Only lasers approved by the Navy LSRB in use.	
Range adequately controlled to prevent unauthorized entry.	

³Comply with MIL-HDBK-828.

⁴MIL-STD-1425, Appendix C, provides background on design requirements for laser eye protection.