

**BY ORDER OF THE COMMANDER  
934TH AIRLIFT WING**

**934th AIRLIFT WING INSTRUCTION  
48-105**



**16 FEBRUARY 2016**

***Aerospace Medicine***

**934 AW LASER SAFETY PROGRAM**

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

---

**ACCESSIBILITY:** Publications and forms are available on the e-Publishing website at [www.e-publishing.af.mil](http://www.e-publishing.af.mil) for downloading or ordering.

**RELEASABILITY:** There are no releasability restrictions on this publication.

---

OPR: 934 MSG/SGPB

Certified by: 934 MSG/CC  
(Col Craig S. Petersen)

Pages: 11

---

This instruction incorporates guidance and criteria for the safe use of lasers and laser systems as defined in the American National Standards Institute Z136.1 and Air Force Instruction 48-139, Laser and Optical Radiation Protection Program. Refer recommended changes and questions about this publication to 934 MSG/SGPB using the AF Form 847, Recommendation for Change of Publication; route the form directly to the 934 MSG/SGPB at Minneapolis St Paul ARS. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

**1. Purpose.**

1.1. The purpose of the laser and optical radiation protection program is to protect health and prevent injury that could have a debilitating effect on human performance. The program is designed to define and mitigate laser related risks.

**2. Roles and Responsibilities.**

2.1. Installation Commander.

2.1.1. Designates, in writing, Bioenvironmental Engineer (BEE) workers as a primary and alternate Installation Laser Safety Officer (ILSO).

2.1.2. Delegates authority to the ILSO to suspend installation operations involving the operation of laser or other optical radiation sources that pose a significant health risk to personnel, are in clear violation of regulations or requirements, or can negatively impact AF operations material, or real estate.

2.1.3. The Installation Commander has delegated the final approval authority of the acquisition of all FDA-Compliant Lasers (Class 1M, 2M, 3R, 3B or 4) to the ILSO.

## 2.2. Installation Laser Safety Officer (ILSO).

2.2.1. Adheres to the ILSO duties and responsibilities IAW AFI 48-139, Laser and Optical Radiation Protection Program and ANSI Z136.1-2014, American National Standard for Safe Use of Lasers.

2.2.2. The ILSO shall verify classifications of 3B and 4 lasers and laser systems.

2.2.3. The ILSO shall do hazard evaluations on the Class 3B and Class 4 lasers and laser systems. Conducting an evaluation when new operations, equipment, or modifications that may alter potential personnel hazards. The ILSO will determine the laser class, exposure limits, hazard distances and zones of the Class 3B and 4 lasers and laser systems (if applicable). The ILSO may recommend engineering, administrative (administrative controls need SQ/CC or higher approval), personal protective equipment (laser eye protection and/or skin protection, etc.) and procedural controls for laser hazards IAW ANSI Standard Z136.1 and AFI 48-139.

2.2.4. The ILSO will maintain a listing of hazardous laser and optical radiation equipment. Depending on the equipment, the list could include nomenclature, classification wavelength, unit of assignment (Class 3B or Class 4 lasers), or other hazard descriptors.

2.2.5. ILSO will establish a Laser Safety Committee (LSC) for the base when there are 3 or more units using Class 3B and/or Class 4 FDA-compliant lasers or military specific lasers. The LSC will review the SOPs, hazard assessments and controls for Class 3B and 4 lasers, initial and annual training requirements, the 934 AWI Laser Safety Program and etc. The LSC must meet at least once per year.

2.2.6. ILSO will determine the initial and annual training requirements for lasers users.

## 2.3. Unit Commander.

2.3.1. Appoint in writing a Unit Laser Safety Officer (ULSO).

2.3.2. The ULSO will state in a memorandum to the ILSO the lasers that are being used in the unit and send a completed form (Attachment 3: Class 3B, Class 4 Lasers (Un-Embedded/Unenclosed Laser and Laser Systems) and Military Specific Lasers Worksheet) for each type of laser to the ILSO.

2.3.3. Develops and manages a unit laser safety program.

2.3.4. Do the initial and annual training of laser users, record the training on the AF Form 55 or equivalent and send the training dates to the ILSO.

2.3.5. The ULSO maintains accountability for all Class 3B and 4 lasers and laser systems and all military specific lasers, regardless of class, possessed by the unit.

2.3.6. Makes sure that the worker using a laser has been trained to operate the laser in a safe manner.

2.3.7. In coordination with the unit commander, suspends unit operations involving the operation of laser or any optical radiation sources that pose a significant health risk to personnel, are in clear violation of regulations or requirements, or can negatively impact AF operations, material or real estate.

2.3.8. Coordinates with the ILSO as needed to maintain safe operation of lasers.

2.3.9. Coordinates with the ILSO to create SOPs and any review of controlling documents prior to startup of new laser operations.

2.3.10. Ensures the outdoor use of unit lasers adheres to federal, military, state and local regulations.

2.3.11. Maintains a copy of the AF LSSRB approval letter and hazard evaluation for each type of military specific laser acquired by the unit.

2.3.12. Ensures that no military specific laser is released outside of the AF unless it is transferred to another DoD Service that has approved the use of the system, has been brought into full compliance with 21CFR 1040.10 and 1040.11, and has the compliance paperwork filed with the FDA; or has been destroyed IAW DODI 4160.21-M.

#### 2.4. Shop Supervisor.

2.4.1. The supervisor shall not permit operation of a new or modified Class 3B or Class 4 laser under his or her authority without the approval of the ILSO.

2.4.2. Develops unit procedures and provides training for workers and visitors, as applicable, for any laser or optical radiation system.

2.4.3. Ensures users of any Class 1M, 2M, 3R, 3B, or 4 laser, military specific laser, or optical radiation sources are trained upon initial assignment to the unit and annually thereafter. This extends to those individuals that conduct routine maintenance on any Class 3B or Class 4 embedded lasers.

2.4.4. Ensures incidental personnel (example: personnel such as housekeepers, who are not allowed to work around the laser when it is on) are adequately trained in procedures and policies in areas with active lasers or other optical radiation systems. As a minimum, personnel shall be trained on safe work practices and descriptions of warning signs and hazard zones.

2.4.5. Ensures visitors receive training, personal protective equipment such as laser eye protection or skin protection (when required), and permission to enter a laser controlled area. As a minimum, visitors shall be trained on safe work practices, specific hazards, and procedures to follow in the event of a suspected overexposure to laser or other optical radiation.

2.4.6. Document initial and annual laser training on AF Form 55 or electronic equivalent.

2.4.7. Ensures the outdoor use of lasers adheres to federal, military, state and local regulations.

#### 2.5. Worker.

2.5.1. Worker is trained on and shall follow all laser safety procedures.

2.5.2. A worker shall not energize or work with or near a laser unless authorized to do so by the supervisor for that laser.

2.5.3. Worker shall comply with safety rules and procedures prescribed by the supervisor and the ULSO and/or ILSO.

2.5.4. Ensures all required controls, warning signs, safety devices, and personal protective equipment are functional and in place before operating lasers.

2.5.5. Ensures the outdoor use of lasers adheres to federal, military, state and local regulations.

## 2.6. Military Specific Laser Users.

2.6.1. The users of military specific lasers are trained in the hazards and safe use of the lasers he/she is using and the alternate control measures approved by the AF LSSRB.

2.6.2. Users of military specific lasers shall adhere to the approved AF OIs, TTPs, SOPs and CONOPs/CONEMPs.

2.6.3. Targets shall be positively identified and situational awareness maintained during military specific laser operations and training to avoid unintended exposures to personnel.

2.6.4. Laser eye protection, appropriate for the military specific lasers, shall be worn IAW the AF LSSRB approval letter and SOPs.

## 2.7. 934 Contracting Office.

2.7.1. All solicitations for goods or services that use or contain Class 1M, 2M, 3R, 3B or 4 FDA-compliant lasers or military-specific lasers to include commercial-off-the-shelf (COTS) lasers must be approved by the ILSO prior to award and procurement.

2.7.2. A contractor will notify the ILSO, at least 30 days in advance, of a contractor performing operations using military specific lasers, or Class 3B or Class 4 FDA-compliant laser systems that impacts AF property or personnel.

2.7.3. A contractor will notify the ILSO prior to a contractor bringing Class 3B or 4 lasers on the installation, and provides laser hazard and control information to the ILSO and/or ULSO for authorization prior to use.

## 2.8. 934 Safety.

2.8.1. Reviews and recommends policies and procedures to prevent mishaps from ancillary safety hazards, such as electrocution, fire hazards, etc.

2.8.2. Periodically evaluates procedures and inspects facilities to ensure compliance with federal, military, state and local safety requirements.

2.8.3. Investigates accidents/incidents related to exposures causing operational impacts, damage to systems and/or sensors, or ancillary safety hazards associated with a laser or any optical radiation system IAW AFI 91-204, Safety Investigations and Reports.

2.8.4. Reports known laser accidents/incidents involving aircrew to ASTS to ensure medical screening and exposure documentation, as appropriate.

2.8.5. Reports the illumination of military aircraft from lasers or high intensity lights to Base Operations, AFRC HQ Safety, ILSO and coordinates with local and federal investigators (FAA – Federal Aviation Administration).

### 3. Training.

3.1. Users of Class 3B and 4 lasers or military specific lasers must have initial and annual laser safety training. The training must include the following:

- 3.1.1. Fundamentals of laser operation (physical principles, construction, etc.)
- 3.1.2. Bio effects of laser radiation on the eye and skin.
- 3.1.3. Significance of specular and diffuse reflections.
- 3.1.4. Non-beam hazards of lasers.
- 3.1.5. Laser and laser system classifications.
- 3.1.6. Safe work practices
- 3.1.7. Control measures for the laser.
- 3.1.8. Specific hazards of the laser and laser system.
- 3.1.9. Overall responsibilities of management and worker.
- 3.1.10. Medical examination practices (if applicable).
- 3.1.11. Procedures to follow in the event of a suspected laser exposure.
- 3.1.12. The use of personal protective equipment (laser eye protection) for the eyes and skin (for all workers within the NHZ).
- 3.1.13. Workers servicing or working on lasers with exposed high voltages and/or the capability of producing potentially lethal electrical currents.

3.2. In consultation with the ILSO, the ULSO shall determine what, if any, training is commensurate with the laser hazards accessible at the unit level for Class 1M, 2, 2M, 3R lasers and Laser Pointers.

3.3. Class 1M and Class 3R Awareness Training. For optional Class 1M and Class 3R education, simple, brief programs may be developed that are designed for easy implementation by the shop supervisor or ULSO.

- 3.3.1. Simple explanation of a laser.
- 3.3.2. Comparison of the differences between laser light and ordinary light.
- 3.3.3. Description of the nature of near Infrared laser beams where applicable.
- 3.3.4. Explanation of Class 1M and 3R lasers, and the relative potential hazard of each.
- 3.3.5. Explanation of the potential for collecting and focusing optics to increase the hazard.

3.4. Class 2 and Class 2M Awareness Training. For optional Class 2 and Class 2M education, simple, brief programs may be developed that are designed for easy implementation by the shop supervisor or ULSO.

- 3.4.1. Simple explanation of a laser.
  - 3.4.2. Comparison of laser light with ordinary light.
  - 3.4.3. Explanation of a Class 2 laser with the concept that it is harmless for exposure duration less than the human aversion response time of 0.25 seconds.
  - 3.4.4. Explanation of the differences between Class 2 and Class 2M lasers.
  - 3.4.5. Provide statement cautioning against intentional overcoming of the human aversion and staring into a Class 2 or a Class 2M laser beam.
  - 3.4.6. General explanation of the differences in the various laser classifications.
- 3.5. Class 2 Laser Pointer Awareness Training. If laser pointer awareness education is determined to be desirable, suggested topics can include the following:
- 3.5.1. Simple explanation of a laser.
  - 3.5.2. Comparison of laser light with ordinary light.
  - 3.5.3. Precautions for use.
  - 3.5.4. Effects of exposures.
  - 3.5.5. Misuse/FDA warning on misuse of laser pointers.
  - 3.5.6. FDA limit of 5 milliwatts.
  - 3.5.7. Local ordinance limitations.

#### **4. Medical Exams.**

- 4.1. The Occupational and Environmental Health Working Group (OEHWG) will approve any medical surveillance examination requirements because of a worker using a Class 3B or Class 4 laser. The laser medical exam requirements for the shop workers will be reviewed annually by the OEHWG and the LSC.
- 4.2. The AF shall retain the individual's laser medical exam records for the lifetime of the worker plus 30 years.
- 4.2.1. 934 ASTS will store the laser medical exam records for the civilians and the reservists while they are working at the base.
    - 4.2.1.1. When a reservist leaves the base for another AF base, his/her medical records (including his/her laser medical exam records) will be transferred to his/her new AF base.
    - 4.2.1.2. When a reservist leaves the base and is not transferring to another AF base, 934 ASTS will send his/her medical records (including his/her laser medical exam records) to the AF Service Treatment Records (STR) Processing Center in San Antonio TX for the storage of military medical records.
    - 4.2.1.3. When a civilian is no longer employed by the base, the 934 ASTS will send his/her medical records (including his/her laser medical exam records) to the civilian National Personnel Records Center in St. Louis MO for storage of the civilian medical record.

## 5. Accidents.

- 5.1. Safety will conduct any suspected laser accident/incident investigations for the base in coordination with ILSO.
- 5.2. When a suspected laser exposure occurs, the following steps will be taken:
  - 5.2.1. Seek medical attention without delay.
  - 5.2.2. Notify immediate supervisor.
  - 5.2.3. Supervisor will call the ULSO about the accident.
  - 5.2.4. The ULSO will contact the ILSO, and the ILSO will call the Laser Hotline (1-800-473-3549 or DSN 798-3764).
  - 5.2.5. The ILSO will notify Safety, ASTS OEHWG and AFRC HQ SGPB of the laser accident/incident.
  - 5.2.6. Safety will coordinate with the ILSO, ULSO, BEE/PH, ASTS OEHWG and shop supervisor to investigate the laser accident/incident. If the person has been injured by a laser, the occupational illness investigation results will be entered in the AF Safety Automated System.
  - 5.2.7. If a military person has a suspected laser accident/incident, follow the above procedures and also notify an ASTS (Flight Surgeon) about the incident.

KEITH T. WESLEY, Colonel, USAFR  
Commander, 934 Airlift Wing

**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 48-139, Laser and Optical Radiation Protection Program  
AFI 91-204, Safety Investigations and Reports  
ANSI Z136.1 – 2014, American National Standard for Safe Use of Lasers  
AFRL-SA-WP-SR-2012-0005, United States Air Force School of Aerospace Medicine Laser Injury Guidebook, April 2012  
AFRL-SA-WP-SR-2014-0015, Bioenvironmental Engineer's Guide for Lasers and Optical Radiation, August 2014

***Adopted Forms***

AF Form 55, Employee Safety and Health Record

***Abbreviations and Acronyms***

**AF**—Air Force  
**AFRC**—Air Force Reserve Command  
**AFSAS**—Air Force Safety Automated System  
**ASTS**—Aeromedical Staging Squadron  
**AWI**—Air Wing Instruction  
**BEE**—Bioenvironmental Engineer  
**CFR**—Code of Federal Regulations  
**COTS**—Commercial Off the Shelf  
**DoD**—Department of Defense  
**DODI**—Department of Defense Instruction  
**FDA**—Food and Drug Agency  
**HQ**—Headquarters  
**ILSO**—Installation Laser Safety Officer  
**IAW**—In Accordance With  
**LSC**—Laser Safety Council  
**LSSRB**—Laser System Safety Review Board  
**M**—Military  
**MPE**—maximum permissible exposure  
**OEHWG**—Occupational and Environmental Health Working Group

**PH**—Public Health

**SOP**—Standard Operating Procedures

**TO**—Technical Orders

**ULSO**—Unit Laser Safety Officer

## Attachment 2

### LASER HAZARD CLASSES

**A2.1.** Class 1 Lasers: Class 1 lasers are considered to be incapable of producing damaging radiation levels, and are therefore exempt from most control measures or other forms of surveillance. Example – laser printers.

**A2.2.** Class 1M Lasers: Class 1M laser is safe for all conditions of use except when the laser beam is passed through magnifying optics such as microscopes and telescopes.

**A2.3.** Class 2 lasers: Class 2 lasers emit radiation in the visible portion of the spectrum, and protection is normally afforded by the normal human aversion response (blink reflex) to bright light. These lasers may be hazardous if viewed directly for extended periods of time. Example – laser pointers and many measuring instruments.

**A2.4.** Class 2M lasers. Class 2M lasers pose the same ocular hazards to the unaided eye as Class 2, but are potentially hazardous when viewed with optical aids.

**A2.5.** Class 3R lasers. Class 3R lasers do not produce injury under normal conditions when viewed for a very brief period with the unprotected eye. These lasers may present a hazard if viewed using collecting optics, e.g., telescopes, microscopes or binoculars

**A2.6.** Class 3B lasers: Class 3B lasers can cause severe eye injuries when viewed directly or from specular reflection. A Class 3B laser is not normally a fire hazard, though in some circumstances flammable liquids could be ignited. Example: Class 3B lasers are used inside CD and DVD writers, although the writer unit itself is Class 1 because the laser light cannot leave the unit.

**A2.7.** Class 4 lasers: Lasers that present an eye hazard from direct and diffuse reflections. In addition, such lasers can cause combustion of flammable materials and produce serious skin burns and injury from direct exposure.

Attachment 3

CLASS 3B, CLASS 4 LASERS (UN-EMBEDDED/UNENCLOSED LASER AND LASER SYSTEMS) AND MILITARY SPECIFIC LASERS WORKSHEET

Unit/Shop: \_\_\_\_\_ Date: \_\_\_\_\_

ULSO: \_\_\_\_\_ Shop Supervisor: \_\_\_\_\_

Name of Laser: \_\_\_\_\_

Class of Laser: \_\_\_\_\_

Location of Laser: \_\_\_\_\_

Military Laser: Yes No Have LSSRB approval letter: Yes No

Information about the laser:

Manufacturer: \_\_\_\_\_ Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_ Medium (argon, ND-Yag, etc): \_\_\_\_\_

Wavelength: \_\_\_\_\_ How many lasers: \_\_\_\_\_

Purpose of laser: \_\_\_\_\_

Laser to be used outdoors: Yes No

Engineering Controls: \_\_\_\_\_

\_\_\_\_\_

Administrative Controls: \_\_\_\_\_

\_\_\_\_\_

Personal Protective Equipment (Laser Eye Protection – Manufacturer, model number,

OD@Wavelength, etc): \_\_\_\_\_

\_\_\_\_\_

Ancillary Hazards (non-beam hazards, fire, explosion, laser generated contaminants, etc):

\_\_\_\_\_