HEADQUARTERS
DEPARTMENT OF THE ARMY
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NATIONAL GUARD REGULATION 385-11

# Safety
# Ionizing and Nonionizing Radiation Protection

By Order of the Secretary of the Army:

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**Summary.** This regulation supplements the U.S. Nuclear Regulatory Commission (NRC) Rules and Regulations (Title 10, Energy, Code of Federal Regulations (10 CFR)) and augments Army Regulation (AR) 385-11, Ionizing Radiation Protection, as it pertains to the Army National Guard (ARNG). In addition, it supplements the guidance provided by ANSI Z136.1, Safe Use of Lasers, and DODI 6055.11, Protection of DOD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers.

**Applicability.** This regulation applies to all ARNG commands, units, facilities and activities that use, store, handle, maintain, transport, or dispose of radioactivematerials/ionizing radiation-producing devices or use/maintain radiofrequency (RF) and laser radiation producing devices. This includes any non-ARNG organization wanting to store or use radioactive materials/ ionizing radiation-producing devices or RF/laser radiation producing devices on ARNG property or under ARNG control.

This regulation does not apply to radioactive materials for medical use (see TB MED 525) or nuclear weapons. See AR 50-5.

**Internal Control Systems.** This regulation is subject to the requirements of AR 11-2. It contains internal control provisions but does not contain checklists for conducting internal control reviews.

**Impact of New Manning System.** This regulation does not contain information that affects the New Manning System.

**Supplementation.** Supplementation to this regulation is prohibited without prior approval from National Guard Bureau (NGB-AVN-SO), 111 South George Mason Drive, Arlington, VA 22204-1382.

**Interim Changes.** Interim changes to this regulation are not official unless they are authenticated by the Chief, Administrative Services. Users will destroy interim changes on their expiration date(s), unless sooner superseded or rescinded.

**Suggested Improvements.** The proponent for this regulation is NGB-AVN. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to NGB-AVN-SO, 111 South George Mason Drive, Arlington, VA 22204-1382.

DISTRIBUTION: A

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## Chapter 1
## General Provisions

### 1-1. Purpose
This regulation establishes policy and responsibilities for the licensing, control, possession, use, storage, transportation, and disposal of radioactive material and ionizing radiation producing devices within the ARNG. In addition, it establishes policies, defines responsibilities and prescribes procedures which will ensure personnel safety during the operation and maintenance of radiofrequency (RF) and laser radiation producing equipment within the ARNG.

### 1-2. References
Required and related publications are listed in **appendix A**.

### 1-3. Explanation of abbreviations and terms
Abbreviations and special terms used in this regulation are explained in the **glossary**.

### 1-4. Objective
The primary objectives of this regulation are to ensure:

**a.** Radiation protection responsibilities are given priority.

**b.** Plans are developed and resources allocated to effectively implement and manage the state Ionizing Radiation Protection Program (IRPP) and Nonionizing Radiation Protection Program (NRPP).

**c.** Commitments made in NRC licenses, Department of the Army Radiation Authorizations (DARA) and Department of the Army Radiation Permits (DARP) are fulfilled.

**d.** To ensure personnel are not exposed to ionizing or nonionizing radiation in excess of the standards adopted by the Department of the Army (DA) and the Department of Defense (DOD).

### 1-5. Policy and Procedures

**a.** Military and civilian employees within the United States or overseas will be afforded radiation safety and training at least equal to that required by 10 CFR Parts 19, 20, and 21, ANSI Z136.1, and DODI 6055.11.

**b.** Federal, State and local transportation laws, ordinances, and regulations apply to military shipments within or returning to the United States. Safety procedures for moving radioactive material require protection equal to or greater than that required by interstate commerce.

**c.** Overseas, the standards of the host nation through which a radioactive shipment moves apply, provided they are equal to or greater than those required in the United States.

### 1-6. Responsibilities

**a.** Federal Regulatory Agencies. The Federal agencies that govern radioactive material and ionizing radiation producing devices in the United States and its territories are the NRC, U.S. Department of Transportation (DOT) and the U.S. Postal Service (USPS).

**(1)** The Nuclear Regulatory Commission (NRC). The NRC is responsible for licensing and enforcing the use of licensed radioactive material. NRC regulations are contained in 10 CFR. The address and telephone number of the NRC Regional Office for your area is contained on NRC Form 3, Notice to Employees.

**(2)** The U.S. Department of Transportation. The DOT regulates the movement of radioactive material in interstate commerce by rail, water, air, and public highway (except the U.S. mail). DOT regulations are contained in 49 CF.

**(3)** U.S. Postal Service. The USPS regulates the transit of radioactive material in the U.S. mail. Postal requirements are published in USPS Publication 6.

**b.** National Guard Bureau (NGB) will ensure that each National Guard command, unit, facility, or activity that receives, uses, stores, handles, maintains, transports or disposes of radioactive materials or ionizing radiation devices will have an effective IRPP. Similarly, any command, unit, facility, or activity that uses or maintains RF and laser radiation producing devices will have an effective NRPP. These programs will be supported with adequate budgetary and manpower resources including a qualified State Radiation Protection Officer (SRPO), an Alternate State Radiation Protection Officer (ASRPO), radiation detection equipment, and necessary facilities and procedures.

**c.** U.S. Army Communications-Electronics Command (CECOM), Directorate of Safety Risk Management (DSRM) will--

**(1)** Serve as Radiation Control Officer (RCO) and technical advisor to NGB for all DOD radioactive items of supply and ionizing/nonionizing radiation producing devices used by ARNG States/Territories. Authority as RCO is delineated under a Memorandum of Understanding (MOU) between CECOM and NGB

**(2)** Establish NGB IRPP and NRPP policy/criteria requirements to assure NGB compliance with life cycle management controls incorporated in NRC licenses, DARAs, DARPs, and Federal and DOD regulations regarding DOD radioactive items and ionizing/nonionizing radiation producing devices.

(3) Audit ARNG facilities/activities to ensure NGB compliance to NRC licenses/DARAs/DARPs and Federal/DOD regulations.

(4) Provide NGB and affected NRC licensees with copies of evaluation reports to ensure command response to program evaluations.

(5) Develop and provide radiation protection training to qualify ARNG personnel that work with radioactive items and ionizing radiation producing devices.

(6) Provide technical advice and assistance to ARNG personnel who receive, use, store, handle, maintain, transport and dispose of radioactive material and ionizing radiation producing devices or work with RF and laser producing equipment.

(7) Provide Active (Health & Safety) calibration and repair of ARNG ionizing radiation detection instruments.

(8) Provide counting laboratory services capable of detecting any of the radioactive isotopes used by the ARNG. Detection sensitivity and precision to levels acceptable for source leak tests, shipment release, and low level contamination detection.

**d.** The Adjutant General of each State and Territory will--

(1) Provide and maintain adequate resources and facilities to ensure safety of personnel, property, and the environment. These resources will include--

(a) Qualified personnel. (See Definitions)

(b) An adequate number of calibrated radiation survey and monitoring instruments. When type classified instrumentation is not available, commercial procurement is authorized.

(2) Designate, in writing, qualified personnel to serve as SRPO and ASRPO to establish a formal written radiation safety program consistent with Federal, DA and ARNG regulations. The Occupational Health Nurse/Manager (OHN/OHM), or other designation as approved by NGB, may be appointed the duties of SRPO as an additional duty assignment. When the OHN/OHM or other designation is not appointed as SRPO, the SRPO will be a full time technician of the Safety Office or Special Staff to the Chief of Staff as designated by the Adjutant General Safety Office or Special Staff to the Chief of Staff as designated by the Adjutant General. When possible, the ASRPO should also be a full time technician. If desired, the responsibility for the NRPP may be separated from that of the IRPP by the appointment of a Laser Safety Officer (LSO) or RF Safety Officer (RFSO), as appropriate, to oversee the implementation of the program. If a separate LSO/RFSO is appointed, it is assumed that they will be responsible for those items designated in Paragraph 1-6(e) that relate to the nonionizing radiation protection program.

(3) Forward SRPO/ASRPO designations, qualifications, and training certificates to the NGB RCO. If separate appointments are made for an LSO and RFSO, forward copies of designation and qualifications to the NGB RCO as well.

(4) Enforce policies prescribed by the NRC, DOD, DA, and NGB RCO for the safe receipt, use, storage, handling, maintenance, transportation, disposal of radioactive materials and the safe use of ionizing and nonionizing radiation producing devices.

**e.** State Radiation Protection Officer (SRPO). The SRPO will--

(1) Be responsible for the management of the state's IRPP and NRPP unless there is a separate appointment for LSO or RFSO. Then the SRPO's responsibility is to the IRPP only. Where inadequacies require command attention for resolution, advise the commander through locally established channels.

(2) Advise all non-ARNG agencies wanting to use or store radioactive materials on ARNG property of the requirements of this regulation and AR 385-11, Ionizing Radiation Protection. All ARNG contracts and leases will contain the requirement to restore ARNG property to unrestricted use as defined by NRC and DA criteria. This regulation will be referenced as the authority.

(3) Ensure that licensed or authorized radioactive material is not transferred to unauthorized recipients or organizations.

(4) Provide guidance on creating working conditions and operating procedures that comply with applicable regulations and directives.

(5) Review and forward the qualifications of each Individually Controlled Radioactive Item (ICRI) Local RPO and alternates to NGB RCO. (see **appendix B** for a listing of ICRI's)

(6) Take action when a qualified Local RPO is not available. In these instances, the SRPO will--

(a) Deny the requisition and/or use of the radioactive material.

(b) Stop use of on-hand radioactive material until someone can be qualified by training.

(c) Transfer radioactive items to a location or activity that has the proper RADIAC equipment, facility, and qualified personnel to support the item(s).

(7) Annually instruct ionizing radiation workers in safe work procedures, emergency procedures, harmful effects of radiation over-exposures, and other topics required by 10 CFR Parts 19, 20 and 21. This may be either written or formal instruction. Document and maintain records of training in accordance with Modern Army Record Keeping System (MARKS, AR 25-400-2).

(8) Evaluate and document hazards related to specific equipment, materials, facilities, procedures and operations involving the receipt, use, storage, handling, maintenance, transportation, disposal, or loss of control of radioactive material to ensure that adequate controls and safeguards are in place.

(9) Maintain records listed in paragraph 4-3, Reports and Records, of this regulation.

(10) Ensure that radioactive items are handled in accordance with DA and NRC regulations.

(11) Successfully complete one of the following to satisfy SRPO initial training requirements:

(a) CECOM Directorate of Safety Risk Management Radiation Protection Officer Course (Presented by NGB RCO).

(b) Radiological Safety Course, 4J-F3 (U.S. Army Chemical School).

(c) Equivalent training as approved and/or conducted by the NGB RCO.

(12) Attend a minimum of 8 hours of continuing IRPP management training at intervals not to exceed 24 months. Attendance at the CECOM SRPO Refresher Training Course meets this requirement. Equivalent training, approved by the NGB RCO, may also be used to meet this requirement. The training will consist of:

(a) Refresher training in ionizing radiation basics, radiation detectors and theory.

(b) Current radiation incidents review and lessons learned.

(c) Changes to U.S. Army, Nuclear Regulatory Commission, and Department of Transportation Regulations and relevant technical material.

(13) Establish a personnel dosimetry program in accordance with AR 40-14 at each unit, facility or activity, for personnel who have the potential to receive 10% of the annual dose limit.

(14) Provide (or have each facility LRPO provide) the local fire department with written notice of the--

(a) Location and types of ICRIs stored at a facility. A copy of the written notification to the local fire department will be maintained on file.

(b) Storage locations, types and typical quantities of licensed radioactive material stored at the United States Property & Fiscal Office (USP&FO), Combined Support Maintenance Shop (CSMS) and other maintenance/support facilities.

(15) Assure the maintenance of a current inventory/ description of all potentially hazardous laser and RF devices or operations.

(16) Review written laser and RF SOPs for adequacy prior to approval by the commander or the staff official who has been delegated the responsibility.

(17) Conduct inspections of locations where laser and RF devices are used as considered necessary or upon request.

(18) Ensure safety training is conducted for all personnel who use nonionizing radiation producing equipment prior to their becoming authorized users. Annual refresher briefings for all laser/RF personnel is recommended. Briefings will provide a background on the nature of laser/RF radiation, the hazards associated with these sources, and the means by which personnel can avoid potentially hazardous exposures.

(19) Ensure that proper medical surveillance examinations/ records are maintained for laser personnel as required.

(20) Review and coordinate investigations pertaining to reports of accidents/incidents involving laser/RF systems.

**f.** Alternate State Radiation Protection Officer (ASRPO) will assist the SRPO in the management of the IRPP and NRPP. In the absence of the SRPO, the ASRPO will assume the IRPP and NRPP responsibilities and duties of the SRPO. Qualifications and requirements of the ASRPO are the same as those required for the SRPO.

**g.** Local Radiation Protection Officer (LRPO) for ICRI, as designated by the local activity commander with the concurrence of the SRPO, will--

(1) Be qualified to perform duties as specified in the applicable Technical Manual for an ICRI.

(2) Ensure that radioactive items are properly received, used, stored, handled, maintained, transported, and disposed of.

(3) Maintain records (paragraph 4-3, Reports and Records) for the ICRI listed in **appendix B**, as applicable.

(4) Advise the SRPO of any proposed change in:

(a) Accountability of an item.

(b) LRPO/Alternate LRPO assignment.

(c) The location of an ICRI. An ICRI will not be relocated or released from accountability until the NGB RCO and the applicable commodity command item manager evaluates and approves the relocation, the qualifications of the receiving LRPO and the effectiveness of the IRPP at the receiving activity. (See **appendix D** to identify commodity command managers).

(5) Submit a radiation incident report within 24 hours to NGB RCO through the SRPO (paragraph 2-5, Accident Reporting) by electronic means to report:

(a) A theft, loss of control, destruction, or leakage of radioactive material.

(b) Damage of an ICRI and/or suspected radiological over-exposures (10 CFR, Parts 19, 20, 21, 30, 40, and 70 and AR 385-40). Potentially damaged items will not be used until their safety is confirmed and approved by NGB RCO.

(6) Send a written follow-up of the electronic report giving the details of the incident, the corrective actions taken, and program modifications instituted to prevent a recurrence through the SRPO to the NGB RCO within 15 days of the incident.

(7) Establish a radiation controlled area if the use or storage of radioactive materials may--

(a) Create exposure rates in excess of 2 millirem per hour (mrem/hr).

(b) Cause personnel to receive 50 or more millirem in a calendar year.

(8) Post:

(a) Current copy of NRC Form 3, Notice To Employees, when required by 10 CFR Part 19.11.

(b) Radiation warning signs as required by 10 CFR 20.1901-1905.

(c) List of individuals and phone numbers to notify in the event of an emergency.

(d) Sign prohibiting Smoking, Eating, Drinking, Chewing Gum, or Applying Cosmetics, as required.

(e) Section 206 of the Energy Reorganization Act of 1974.

(f) 10 CFR, Parts 19, 20 and 21.

(g) A copy of the local SOP or regulation.

(h) A copy of the applicable NRC License.

(i) All Notices of Violation from the NRC.

(j) In lieu of posting items (f) through (h) above, you may post a memorandum indicating where employees may review the documents.

(9) Ensure that ICRIs are stored and used as prescribed in applicable licenses and/or technical publications.

**h.** Locations that routinely maintain, store, ship, and receive radioactive materials, but do not possess an ICRI, will also require the appointment of an LRPO. This includes, but is not limited to, United States Property & Fiscal Office Warehouses, Mobilization and Equipment Training Sites and Unit Training Equipment Sites (if a radioactive material storage area is established). The LRPO for these locations will --

(1) Be qualified to perform radiation protection duties.

(2) Ensure that radioactive items are properly received, used, stored, handled, maintained, transported, and disposed of.

(3) Maintain records, as applicable, to support the radiation protection program.

(4) Advise the SRPO of any proposed change in:

(a) Accountability of an item.

(b) LRPO/Alternate LRPO assignment.

(5) Submit a radiation incident report within 24 hours to NGB RCO through the SRPO (paragraph 2-5, Accident Reporting) by electronic means to report a theft, loss of control, destruction, or leakage of radioactive material.

(6) Send a written follow-up of the electronic report giving the details of the incident, the corrective actions taken, and program modifications instituted to prevent a recurrence through the SRPO to the NGB RCO within 15 days of the incident.

(7) Establish a radiation controlled area if the use or storage of radioactive materials may--

(a) Create exposure rates in excess of 2 millirem per hour (mrem/hr).

(b) Cause personnel to receive 50 or more millirem in a calendar year.

(8) Post:

(a) Current copy of NRC Form 3, Notice To Employees, when required by 10 CFR Part 19.11.

(b) Radiation warning signs as required by 10 CFR 20.1901-1905.

(c) List of individuals and phone numbers to notify in the event of an emergency.

(d) Sign prohibiting Smoking, Eating, Drinking, Chewing Gum, or Applying Cosmetics, as required.

(e) Section 206 of the Energy Reorganization Act of 1974.

(f) 10 CFR, Parts 19, 20 and 21.

(g) A copy of the local SOP or regulation.

(h) A copy of the applicable NRC License.

(i) All Notices of Violation from the NRC.

(j) In lieu of posting items (f) through (h) above, you may post a memorandum indicating where employees may review the documents.

i. Alternate Local Radioactive Protection Officer (ALRPO) will assist the LRPO in the management of the local IRPP. In the absence of the LRPO, the ALRPO will assume the local IRPP responsibilities and duties of the LRPO. Qualifications of the ALRPO are the same as those required for the LRPO.

j. Commanders of organizations and units utilizing laser/RF devices will --

(1) Ensure that personnel comply with applicable regulations and local SOPs.

(2) Ensure that an approved SOP is conspicuously posted in each laser/RF facility.

(3) Ensure that appropriate personnel are included in a medical surveillance program.

(4) Provide the SRPO (or LSO/RFSO) with an annual inventory of potentially hazardous laser/RF systems.

(5) Ensure that all laser/RF radiation workers attend periodic laser/RF safety briefings sponsored by the SRPO (or LSO/RFSO) or the local commander.

k. Immediate supervisors will --

(1) Post appropriate warning signs and notices as required (see paragraphs 3-3d, 7-4e, 7-8, 8-3g, and 8-5).

(2) Assure that personnel operating laser/RF devices receive adequate instructions and training in the use of operational and safety equipment, prior to personnel working with these devices for the first time.

(3) Maintain a roster of all personnel authorized to operate class 3 and 4 lasers, and ensure that required personnel are on a medical surveillance program. Preplacement examinations must be completed prior to personnel participating in laser operations.

(4) Establish written SOPs which include safety rules and special precautions. Written SOPs shall be forwarded to the SRPO for review and approved by the commander or the staff official who has been delegated the responsibility.

(5) Enforce laser and RF SOPs, safety rules, and special precautions.

(6) Report any laser/RF accident, unusual incident, or personnel injury, and refer injuries immediately for medical treatment.

l. Laser and RF operating personnel will --

(1) Know and adhere to SOPs, safety rules, and special instructions.

(2) Assure that operation of laser/RF equipment will not injure other personnel who may be present.

(3) Report to their supervisor any known or suspected accident or personnel injury.

m. Laser Range Safety Officer (LRSO) will --

(1) Ensure that all personnel authorized to participate in the laser operation are thoroughly instructed regarding safety precautions to be followed.

(2) Implement SOPs to ensure --

(a) Established target areas and buffer zones are observed.

(b) Unauthorized personnel do not enter the target area.

(c) Communication with personnel in the target area is maintained and that required protective eyewear is worn during the operation of the laser.

(d) Immediate reporting of suspected overexposure of the eyes to laser radiation so that an eye examination can be performed.

## Chapter 2
## Licensing and Control of Ionizing Radiation Sources

### 2-1. NRC Specific Licenses

NRC specific licenses will not be obtained by NGB, ARNG units, facilities, or activities. ARNG units, activities, and facilities may requisition, issue, store, transport, and use standard type issue items in the Army supply system that have been licensed by or to U.S. Army Materiel Command (AMC) major subordinate commands (MSCs).

### 2-2. DA Radiation Authorizations and DA Radiation Permits

a. DARAs and DARPs will not be obtained by NGB ARNG units, facilities, or activities without the authorization of the NGB RCO. ARNG units, activities, and facilities may requisition, issue, store, transport, and use standard type issue items in the Army supply system that are authorized by DARAs and DARPs managed by AMC MSCs.

b. All non-ARNG organizations or non-Army agencies are required to obtain DA radiation permits for the use, storage, and possession of radioactive sources on ARNG facilities or installations. Concurrence of the local commander, SRPO, NGB RCO, and HQ, AMC is required in order to obtain a DA radiation permit.

An environmental review is required to use or store radioactive materials, radiation sources, or wastes on ARNG property by non-ARNG activities. The requester has the responsibility to prepare the required environmental documentation in accordance with AR 200-2.

**2-3. Technical Advice and Health Physics Surveys**

**a.** Technical advice and assistance for the receipt, use, storage, handling, maintenance, transportation, and disposal of radioactive materials and ionizing radiation producing devices may be obtained on request from NGB RCO: Commander, U.S. Army Communications-Electronics Command, ATTN: AMSEL-SF-RE, Fort Monmouth, New Jersey 07703-5024; Milnet(AMSEL-SF@CECOM3.MONMOUTH.ARMY.MIL); Message (CDR CECOM FT MONMOUTH NJ // AMSEL-SF-RER//); Facsimile on DSN 992-6403 or (732) 532-6403; or Voice on DSN 987-3112 or (732) 427-3112.

**b.** Surveys of x-ray equipment are performed by the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) under a memorandum of understanding with the U.S. Army Medical Command (MEDCOM). Special surveys to certify newly installed x-ray equipment prior to use will be requested from USACHPPM.

**c.** Requests for technical advice and certification surveys from CHPPM will be submitted through NGB-AVN-SO (copy furnished to NGB RCO) to: Commander, U.S. Army Center for Health Promotion and Preventive Medicine, ATTN: MCHB-MR, Aberdeen Proving Ground, MD 21010-5422.

**2-4. Inventory of Radioactive Materials**

**a.** Inventory records will identify:

**(1)** Specific items of equipment.

**(2)** Location of the item(s).

**(3)** Quantity authorized and on-hand.

**(4)** National Stock Number (NSN).

**b.** The SRPO must perform an annual review of the inventory

**c.** The inventory documents will be maintained on record for a period of five years.

**2-5. Accident Reporting**

**a.** Accidents involving sources of ionizing radiation will be reported by electronic or telephonic means within 24 hours to:

**(1)** Respective State Radiation Protection Officer.

**(2)** Respective State Adjutant General.

**(3)** NGB RCO at the address indicated in **appendix D**.

**(4)** ARNG Safety Office at the address listed in **appendix D**.

(5) Appropriate licensee listed in **appendix C**.

**b.** All incidents and accounts will be reported in accordance with AR 385-40.

**Chapter 3**
**Control of Nonionizing Radiation Producing Equipment**

**3-1. Technical Advice and Surveys of Nonionizing Equipment**

**a.** Technical advice and assistance relating to the use of nonionizing equipment and the establishment of a NRPP may be obtained on request from NGB RCO: Commander, U.S. Army CECOM, ATTN: AMSEL-SF-RE, Fort Monmouth, NJ 077035024;Milnet(AMSELSF@CECOM3.MONMOUTH.ARMY.MIL); Message (CDR CECOM FT MONMOUTH NJ// AMSEL-SF-RE//); Facsimile on DSN 992-6403 or (732) 532-6403 or Voice on DSN 987-3112 or (732) 427-3112.

**b.** Surveys of laser and RF systems are performed by the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) prior to fielding. Recommendations from these evaluations on the safe use of these systems is incorporated into equipment technical manuals.

**c.** Requests for technical advice and/or surveys from USACHPPM will be submitted through NGB-AVN-SO (copy furnished to NGB RCO) to: Commander, U.S. Army Center for Health Promotion and Preventive Medicine, ATTN: MCHB-DC-ORF (RF Program) or ATTN: MCHB-DC-OLO (Laser/Optical Program), Aberdeen Proving Ground, MD 21010-5422.

**3-2. Inventory of Nonionizing Equipment**

**a.** An inventory listing of laser and RF radiation producing equipment in each State or Territory will be maintained by the SRPO (or LSO/RFSO). The SRPO (or LSO/RFSO) must review and update the inventory listing annually.

**b.** The laser inventory will include, as a minimum, the type designation/nomenclature of the laser device; the NSN; the total quantity on hand; and the Unit Identification Code (UIC). If possible, it will also contain the hazard classification of the laser.

**b.** The RF inventory will include, as a minimum, the type designation/nomenclature of the RF device; the NSN; the total quantity; and the UIC.

**3-3. Control of Both Laser and RF Radiation Hazards**

**a.** SOPs will be published and enforced for any and all RF and laser systems that present a hazard to personnel. They will specify the safety policies concerning operational limitations placed upon equipment, and the control of movement of personnel to ensure that the exposure to personnel is minimized. Copies of these SOPs will be maintained by the SRPO (or LSO/RFSO).

**b.** All persons working in or frequenting any portion of a controlled environment, where equipment capable of producing nonionizing radiation in excess of the PELs is energized, will be informed of the hazard involved and instructed regarding the rules and procedures to be observed prior to their assignment to such areas. Instruction topics will include:

**(1)** Safe working techniques and procedures.

**(2)** Proper use of protective equipment and devices.

**(3)** Procedures to be followed when an accident or incident occurs.

**(4)** Daily pre-operational, operational, and post-operational checks or inspections to ensure radiation safety.

**(5)** Procedures for maintaining an operational log for each piece of equipment that will identify when interlocks and other control or warning devices are bypassed or over-ridden.

**c.** Records of these instructions will be maintained locally and be subject to review by the SRPO (or LSO/RFSO). They will include a brief outline of the instructions and a list of persons who received them. Refresher training should be given annually, and may be incorporated into other safety briefings/updates.

**d.** All laser and RF controlled environments will be properly marked with appropriate warning signs and, where required, have proper warning signals and safety switches.

**e.** Specified individuals will be notified in the event of emergencies, such as major malfunction of equipment, that may produce potentially hazardous nonionizing radiation fields. A list of those persons and phone numbers will be posted in each controlled area.

**f.** A comprehensive inventory of equipment capable of producing nonionizing radiation in excess of the exposure limits will be maintained. A copy of this inventory will be forwarded to the SRPO (or LSO/RFSO).

**g.** Periodic operational checks will be conducted on all radiation safety devices such as alarms, lights, and interlocks installed on or near radiation sources. Such tests should be conducted prior to system operation. Defective devices will be repaired or replaced, and a log should be maintained of all such cases.

**h.** When interlocks and other control or warning devices are bypassed or over-ridden, operational logs must indicate the purpose and duration.

**i.** All alleged overexposures or accidents involving nonionizing radiation will be reported under the requirements of AR 40-400 and AR 385-40.

**3-4. Medical Surveillance**

The requirements for a medical surveillance program for laser and RF workers is specified by the DA Office of the Surgeon General in a memorandum dated 11 April 1994. In summary:

**a.** Pre-placement and termination examinations are required for any personnel who work with class 3b and 4 laser devices.

**b.** Personnel will be designated as Incidental Laser Workers or Laser Workers by the SRPO (or LSO/RFSO).

**c.** Immediate examinations will be administered when there is a known or suspected laser overexposure. The exam will be performed within 24 hours or as soon as possible after the suspected exposure is reported.

**d.** RF workers have no vision screening requirement beyond that done routinely under other occupational health guidelines. However, in the case of a known or suspected overexposure to RF radiation in excess of five times the PEL, it is recommended that an appropriate eye examination be done.

**3-5. Accident Reporting**

**a.** If an alleged laser or RF radiation over-exposure occurs, the affected activity will:

**(1)** Disconnect the power from the system that caused the potential exposure. Do not alter the configuration of the system.

**(2)** Notify the chain of command and the SRPO (or LSO/RFSO).

**(3)** Ensure that the potentially exposed individual(s) receives an appropriate medical evaluation within 24 hours of the exposure.

**(4)** Notify the NGB RCO within 24 hours at the number provided in **APPENDIX D**.

**(5)** Notify USACHPPM within 24 hours to forward incident information. During duty hours, contact the Laser/Optical Program at DSN 584-3932, or the Radio frequency Program at DSN 584-3353. During non duty hours, contact the staff duty officer at DSN 584-4375.

**(6)** Develop and transmit an RCS MED-16 report per AR 40-400, and an RCS DD-R&E (AR) 1168 (Radiological Incident Report) per AR 385-40.

**b.** The radiological hygiene consultant to the Surgeon General will request that USACHPPM conduct an on-site investigation when:

**(1)** An employee's lesion or ocular complaint may have resulted from exposure to nonionizing radiation.

**(2)** An exposure to RF radiation is five times or more the PEL.

**c.** USACHPPM will conduct investigations of alleged laser or RF radiation exposures and will maintain the U.S. Army Laser and RF Radiation Incident Registry.

## Chapter 4
## Items Containing Radioactive Material

### 4-1. Controls

**a.** Both the NRC and DA require control of all operations involving items containing radioactive material to ensure safety of personnel and property. ARNG units, facilities, and installations having licensed radioactive sources, and the agencies controlling them, are subject to inspections by the NRC.

**b.** When practical, the same logistics procedures applied to all other Army supplies will be used for radioactive items. Army administrative, safety, or regulatory requirements unique to radioactive items are published in supply and technical manuals or bulletins.

**c.** The ICRIs identified in **appendix B** will not be handled by unauthorized personnel. Controls will be imposed so that only trained, qualified personnel will use them. Adequate safety equipment will be available to support the safe use of these items. As required, periodic inventory and leak testing will be performed to ensure that controlled items remain safe and at authorized locations.

### 4-2. Requisitioning, Transfer, and Turn-In

***a. Requisitioning Individually Controlled Radioactive Items.***

**(1)** All requisitions for ICRIs will be sent through the SRPO and NGB RCO to the appropriate AMC MSC commodity manager.

**(2)** Each request will include the following written certification: "Sufficient safety equipment, facilities, and qualified personnel are available at this installation for the safe handling, use, and storage of radioactive material ordered on this requisition".

**(3)** The certification must have the signature and typed name and grade of the SRPO. The SRPO must be on the list of qualified SRPOs maintained by NGB RCO.

***b. Transfer.***

**(1)** ICRIs will not be transferred without the concurrence of the SRPO and the approval of the NGB RCO and the commodity command item manager. Approval for transfer will be given when it is determined that the receiving unit or installation has an authorization for the equipment; an effective, documented IRPP; qualified personnel; appropriate facilities/equipment; and justification for the item.

**(2)** Radioactive items other than ICRIs may be transferred without approval of the NGB RCO.

***c. Turn-in.*** Request for disposition instructions of unwanted radioactive items will be submitted by the SRPO through NGB RCO to: HQ, U.S. Army Industrial Operations Command, Radioactive Waste Disposal Division, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000.

### 4-3. Reports and Records

***a. Records of ICRIs.*** For each ICRI, the SRPO will maintain, or have maintained, records of the following information:

**(1)** NSN.

**(2)** Item Description or Nomenclature.

**(3)** Serial Number.

**(4)** Radio nuclide, source activity, and date radioactivity was determined, if available.

**(5)** Date and results of source leak test.

**(6)** Shipment number.

**(7)** Shipped from and to address.

***b. Records maintenance.*** The above information will be maintained by the ICRI LRPO or SRPO, and the Radioactive Material Control Point (**appendix C**).

***c. Supplemental records.*** In addition to the records listed above, the ICRI LRPO and/or SRPO, will maintain the following reports:

**(1)** Reports of survey, source leak tests, and inspections made on the assigned items.

**(2)** Inventory and source leak test results. All of the above records will be maintained in accordance with MARKS, AR 25-400-2.

### 4-4. Storage of Radioactive Material

**a.** The SRPO, in conjunction with the LRPO, will identify areas for the secure storage of radioactive material.

**b.** All radioactive material storage areas will be posted in accordance with 10 CFR 20.1901-1905.

**c.** In order to minimize personnel exposure, radioactive material will be stored in an isolated and well ventilated area.

**d.** Radioactive materials shall not be stored in the same storage location section with food products, medical supplies, explosives, flammables, photosensitive items or any other incompatible item of supply.

**e.** Radioactive material storage areas will have a written SOP. The SOP should address site specific storage practices, authorized users, surveys, dosimetry (if required), required postings, emergency procedures, etc.

**4-5. Radiation Surveys**

***a. Background Survey.*** Upon designation of a radioactive material storage area, prior to the placement of radioactive material in the area, a dose rate survey will be conducted and documented to record the background radiation levels found in the area.

***b. Initial Survey.*** The SRPO will ensure an initial survey is performed in areas and sites where sources of radiation are initially used, stored and/or maintained. Special emphasis should be placed on radiation field measurements during the initial survey to ensure adequate protection of personnel.

***c. Routine Surveys.*** A survey program shall be established for areas where sources of radiation are used, stored and maintained that require posting such as "CAUTION RADIOACTIVE MATERIAL(S)" or "CAUTION RADIATION AREA". Routine surveys of these areas must be performed to ensure that exposures of personnel to radiation are maintained as low as is reasonably achievable (ALARA). Routine surveys shall be made under representative conditions. Radiation surveys shall be conducted on a quarterly basis unless a different survey requirement is stipulated in the NRC license, the technical manual/bulletin for a specific commodity/ICRI, or as directed by the NGB RCO.

***d. Close-out Survey.*** The SRPO will ensure a close out survey is performed and documented in writing when an operation or project is terminated prior to releasing the facility for unrestricted use. The purpose of the close-out survey is to determine that all radiation sources have been removed and there is no residual contamination.

***e.*** The RPO shall perform area surveys using an "ACTIVE" RADIAC instrument calibrated as required, for the type of radiation to be measured. In addition, the appropriate type of smear shall be used to assess the level of removable contamination present. All radiation survey smears shall be sent to the CECOM DSRM, NGB RCO, for analysis. Address to: U.S. Army Communications-Electronics Command, ATTN: AMSEL-SF-RE (Lab), Building 2539, Fort Monmouth, New Jersey 07703-5024. Be sure to identify the radio nuclide you are requesting analysis for. To inquireabout analysis results call DSN 987-5370, Comm (732) 427-5370.

**f.** Radiation surveys shall be documented and maintained on file according to the MARKS, AR 25-400-2. The following information will be recorded on the radiation survey report:

**(1)** A schematic drawing of the area.

**(2)** Monitoring points recorded on the drawing to include meter readings and wipe locations.

**(3)** Background meter reading(s).

**(4)** Date of survey.

**(5)** Name, title, and signature of the surveyor.

**(6)** Identification of the instrument(s) and detector(s) used, to include serial number(s) and calibration void date.

**(7)** Evaluation of the safety characteristics of the location and operation to include: warning signs, required postings, SOPs, etc.

## Chapter 5
## Transportation of Radioactive Material

**5-1. Transportation Procedures**

**a.** The SRPO shall ensure that activities receiving or transporting radioactive materials develop local procedures for the shipment and receipt of these materials.

**b.** Local procedures shall be IAW the requirements for packaging, preparation for shipment and transportation of licensed radioactive material as established in 10 CFR 71. In addition, the packaging and transport of licensed radioactive material are subject to the requirements contained in 10 CFR parts 20, 21, 30, 40, 70 and 73. The regulations of other agencies, such as the DOT in 49 CFR and the USPS in 39 CFR applies to the transportation of radioactive material.

**c.** All shipments and receipts of radioactive material shall be coordinated with the USP&FO to ensure accountability and that applicable monitoring requirements are performed and documented.

**d.** Transportation of radioactive commodities by military personnel within the confines of a DOD installation are not subject to the requirements of 49 CFR. Transportation of a radioactive commodity outside of a DOD installation for any reason (field exercises, movement to maintenance facility, etc.) is subject to the requirements of 49 CFR. However, transportation of radioactive commodities associated with deployment is not subject to 49 CFR.

**5-2. Shipping Requirements (Outgoing Package)**

**a.** A radioactive package (which consists of packaging material and it's radioactive contents) offered for shipment, shall comply with the applicable requirements of the DOT regulations in 49 CFR parts 170 through 189 appropriate to the mode of transportation.

**b.** Personnel responsible for radioactive shipments should pay particular attention to:

**(1)** Packaging, 49 CFR part 173.

**(2)** Marking and labeling, 49 CFR part 172.

**(3)** Placarding, 49 CFR part 172.

**(4)** Accident reporting, 49 CFR part 171.

**(5)** Shipping papers and emergency information, 49 CFR part 172.

**(6)** Hazardous material employee training, 49 CFR part 172.

**(7)** Hazardous material shipper or carrier, 49 CFR part 107.

**c.** Prior to the shipment of a radioactive package labeled with White I, Yellow II or Yellow III labels, notify the consignee (receiver), SRPO, and RCO with the estimated time of arrival, nature of contents, etc.

**d.** Radioactive material may be loaded with compatible cargo to save space. However, radioactive packages labeled with White I, Yellow II or Yellow III labels, shall not be loaded in the passenger compartment of a vehicle, ship, or commercial aircraft. Prior to shipment, contact the carrier to determine if any special restrictions apply.

### 5-3. Receipt Requirements (Incoming Package)

**a.** Receipt of a radioactive package shall comply with the requirements of 10 CFR 20.1906.

**b.** Receiving personnel shall inspect all incoming shipments of radioactive material labeled with White I, Yellow II or Yellow III labels, to ensure they are marked, labeled, contain appropriate shipping papers and certifications as required. Discrepancies shall be reported on SF 364, Report of Discrepancy.

**c.** Receiving personnel shall submit a report of arrival by electronic or telephonic means to the shipping installation for shipments that exceed the quantities requiring a radioactive shipping label as specified in 49 CFR. This report of shipment shall indicate the time, date of arrival, and the physical condition of packages. If a radioactive labeled shipment has not arrived within 24 hours of the estimated time of arrival, the consignee shall notify the consignor (sender) by electronic or telephonic means. The consignor shall take immediate steps to trace the shipment.

**d.** Administrative data and monitoring results for all radioactive movements (incoming and outgoing) shall be documented on a radioactive material movement form or similar document and maintained on file for three years.

### 5-4. USPS and Express Delivery Service

**a.** The use of U.S. Mail for shipping radioactive material is prescribed in applicable postal regulations (39 CFR and U.S. Postal Publication 6, Radioactive Materials).

**b.** The use of express delivery services, such as FedEx®, UPS®, etc., for shipping radioactive material shall be IAW 49 CFR requirements. Special restrictions and costs may apply to the shipment of radioactive material, therefore, coordinate with the delivery service prior to shipping.

## Chapter 6
## Disposal of Unwanted Radioactive Material

### 6-1. Security

Areas where unwanted radioactive materials are stored will be designated, posted, and protected as controlled areas. Physical safeguards that are at least equal to the degree of hazard or security classification involved will be used.

### 6-2. Consolidation

Activities or installations having unwanted radioactive material, including waste, will place the material in a secure, local radioactive material storage area pending shipment to a land burial site or to an authorized recipient. It is more economical to process large amounts of radioactive material for ultimate disposal than to process small quantities. Therefore, installations able to store and safely consolidate unwanted radioactive material are encouraged to do so before requesting disposition instructions.

### 6-3. Storage

**a.** A posted (Caution Radioactive Material or Caution Radiation Area) controlled area will be designated to store unwanted radioactive material. Security will be provided to prevent unauthorized access or removal of the radioactive material. Safety of the material is the responsibility of the ARNG element that has control of the material.

**b.** When practical, material will be segregated as follows:

**(1)** Combustible liquid.

**(2)** Combustible solid.

**(3)** Combustible gas.

**(4)** Noncombustible liquid.

**(5)** Noncombustible solid.

**(6)** Noncombustible gas.

**6-4. Disposal of Radioactive Waste**

a. Items containing radioactive material that cannot be decontaminated or repaired will be disposed of as unwanted radioactive material.

b. If the cost to decontaminate is prohibitive, contaminated protective clothing and equipment will also be disposed of as unwanted radioactive material when no longer needed.

c. Surplus items containing radioactive material will be disposed of as unwanted radioactive material when:

(1) Licenses or service authorizations require disposal as unwanted radioactive material.

(2) The inventory control point decides that another method of disposal is not in the best interest of the Government.

**6-5. Excess Serviceable or Economically Non-repairable Items**

a. Radioactive property that is excess serviceable or economically non-repairable within the ARNG will be reported through command channels to the National Inventory Control Point for disposition instructions unless the technical literature associated with the radioactive item instructs otherwise.

b. Electron tubes and major end items of equipment containing license-exempt quantities of radioactive material will be disposed of by normal transfer, donation, or sales procedures.

c. Serviceable, uncontaminated radioactive parts of major end items, such as gauges and other instruments, will not be removed from surplus or excess equipment, if the technical literature applicable to the major end item does not direct removal. When these end items or surplus radioactive components are donated or sold:

(1) The donation document will show the "CAUTION" statement in Chapter VI, DOD 4160.21-M.

(2) The sales contract will show the "Radioactive Material" article in Chapter XI, DOD 4160.21M.

d. When not put into major end items or equipment, license-exempt items (except electron tubes) will be subjected to normal Federal agency use screening procedure under DOD 4160.21-M. These items will not be physically moved to a property disposal activity or be donated or reported for sale. Unincorporated items not used by other DOD components or Federal civil agencies will be disposed of as unwanted radioactive material.

e. The following examples of radioactive material are not authorized for donation or sale and can only be transferred within DOD or disposed of as unwanted radioactive material:

(1) Microwave receiver protector tubes.

(2) Marine navigation devices (containing tritium (H3) gas).

(3) Radium sources.

The command having logistical responsibility will screen items for transfer within DOD.

f. Useable licensed items containing radioactive materials may be transferred, donated, or sold only to persons having the proper license to receive them. Only the item manager of the owning activity will screen these items for use or donation. If the items cannot be transferred, donated, or sold, they will be disposed of as unwanted radioactive material. During the disposal phase, these items will not be physically moved to a property disposal activity, nor will they be transferred to Defense Property Reutilization Office accounts.

g. Requests for disposition of radioactive material will be coordinated with the SRPO before the disposition request is forwarded to the NGB RCO.

**6-6. Identification of Radioactive Commodities**

The presence of radioactive items can be determined by--

a. A RADIAC meter.

b. The markings on the items.

c. Information contained in the technical literature governing the item.

d. Guidance in TB 43-0116; the Army Master Data File (AMDF); Hazardous Material Information System (HMIS); and Master Cross Reference Listing (MCRL).

**6-7. Request for Disposal of Radioactive Material**

a. Requests for disposal instructions will be submitted by the generator through the SRPO to NGB RCO who will forward the request to: HQ, U.S. Army Industrial Operations Command, Radioactive Waste Disposal Division, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000.

b. Request for disposal instructions shall contain, as a minimum, the following information:

(1) NSN

(2) Isotope

(3) Activity (Bq)

(4) Nomenclature

(5) Serial number for each ICRI only

(6) Quantity per NSN

(7) Total Activity (Bq)

(8) POC and telephone number to obtain additional information

(9) Remarks

c. Radioactive material disposal requests and shipments will be maintained permanently on file.

## Chapter 7
## Procedures for Safe Operation of Laser Equipment

### 7-1. Laser Hazard Classification Scheme

**a.** The hazard classification scheme is defined by the laser output parameters and are specified in detail in American National Standards Institute (ANSI) Z136.1. The hazards associated with each classification are generally simplified as follows:

**(1)** Class 1 laser devices are not capable of emitting hazardous laser radiation under any operating or viewing condition. As such, they are exempt from any control measures.

**(2)** Class 2 laser devices are continuous wave, visible laser devices. Momentary exposure occurring in an unintentional viewing situation is not considered hazardous due to the aversion response to bright light sources. Precautions are required to prevent continuous staring into the direct beam.

**(3)** Class 3 laser devices are subdivided into two classes (3a and 3b). Class 3a lasers are normally not hazardous unless viewed with magnifying optics from within the beam. Class 3b lasers are potentially hazardous under direct or specular reflection viewing conditions, but the diffuse reflection is usually not a hazard.

**(4)** Class 4 laser devices are a hazard to the eye or skin from the direct beam, a specular reflection, and sometimes from a diffuse reflection. A class 4 laser can be a fire hazard.

**b.** Although there are slight differences between the laser classifications of ANSI Z136.1 and the Federal Laser Product Performance Standard (Title 21, Code of Federal Regulations, Part 1040), lasers or laser systems certified by a manufacturer in accordance with the Federal Laser Product Performance Standard may be considered as fulfilling all classification requirements of the ANSI standard.

### 7-2. Exposure Standards

Standards for exposure to laser radiation are delineated in ANSI Z136.1. Reference to, and application of, these standards should be unnecessary. All Army fielded lasers are classified during manufacture and the hazards are evaluated by USACHPPM prior to fielding. Distances to which the exposure standards are exceeded, and optical density requirements for laser eye protection, are specified in the Technical Manual for the device and summarized in AR 385-63 and/or MIL-HDBK-828.

### 7-3. Personal Protective Equipment

**a.** Eye Protection.

**(1)** Personnel whose occupation or assignment require exposure to potentially hazardous laser beams will be furnished suitable laser safety goggles. The goggles shall protect for the specific wavelength or wavelengths of the laser and have an optical density adequate for the energy involved.

**(2)** The optical density requirements for eyewear needed to protect from specific Army fielded lasers can be found in AR 385-63 and MIL-HDBK-828.

**(3)** Eye protection should have curved lenses to reduce specular reflection hazards.

**b.** Skin Protection. Needless exposure of the skin will be avoided for class 3 and 4 lasers. When the hands or other parts of the body must be exposed to potentially hazardous levels, protective coverings, gloves, or shields shall be used. The face should be turned away from the target area.

### 7-4. General Precautions

**a.** Do not look into the laser beam or specular reflections of the beam.

**b.** The beam will never be directed at personnel.

**c.** Work with lasers will be done in areas of high general illumination (except for night operations and any other operation which requires low light conditions).

**d.** Ensure that laser protective eyewear provides the appropriate wavelength and optical density protection for the laser being used.

**e.** Where feasible, warning signs will be conspicuously displayed in all locations employing class 3 and 4 lasers.

**f.** Eliminate all reflective material from the vicinity of the beam path.

**g.** Appropriate fire extinguishers will be readily accessible for any laser systems that pose a fire hazard.

### 7-5. Laser Facilities

**a.** Windows in a class 4 laser facility will be covered to prevent passage of a hazardous beam into uncontrolled areas and to reduce reflective surfaces.

**b.** Areas in which class 4 lasers are to be operated will be free from polished and reflective surfaces (unless the beams are totally enclosed). Walls and ceilings will be finished with diffuse, non-gloss material.

c. Safety interlocks shall be provided at the entrances of class 4 laser facilities to deny access to unauthorized or transient personnel while the laser power supply is energized and the laser is capable of firing. A warning light with explanatory sign will be conspicuously placed on the outside wall of a closed room to alert personnel that the laser equipment is in operation. If an interlock is impractical or unfeasible for a particular application, alternate methods permitted by ANSI Z136.1 will be implemented.

d. The beam of a class 3b or 4 laser will be terminated by a material which is not highly reflective and which is fire resistant.

**7-6. Laser Range Safety**

a. Outdoor laser operations will be conducted only at firing ranges and non-live fire training areas specifically authorized for their use.

b. An LRSO will be appointed and will assure that SOPs are developed and implemented for all laser range operations. The LRSO is responsible for informing participating personnel of all required safety precautions, for providing target area surveillance to preclude the entry of unauthorized personnel, and for maintaining communication with downrange personnel, if any, to assure that protective eyewear is worn as required.

c. Unprotected personnel shall be excluded from the beam path at all points where the beam irradiance or radiant exposure exceed the appropriate exposure limit. This shall be accomplished by the use of physical barriers, administrative controls, and by limiting the beam traverse.

d. Personnel who are downrange, or in the immediate area of the laser during a laser operation and who may be exposed to radiation exceeding the limits prescribed in ANSI Z136.1, will wear adequate protective eyewear.

e. The tracking of non-target vehicular traffic or aircraft shall be prohibited.

f. The target area shall be cleared of all flat specular surfaces capable of producing reflections that are potentially hazardous, or eye protection shall be required for all personnel within the hazardous area.

g. Local SOPs will provide for the placement of appropriate warning signs during periods of laser range operations and the removal of the warning signs after the termination of the laser range operations.

h. Operation of class 4 laser devices while it is raining or snowing, or when there is dust or fog in the air, should be avoided unless laser protective eyewear is worn by personnel within the immediate vicinity of the beam (e.g., within 2-3 ft of the beam path).

i. Specific procedures to be followed regarding the use of laser devices on laser/firing ranges can be found in Chapter 19 of AR 385-63, Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat.

j. Additional guidance on the safe use of military lasers and laser systems on laser ranges can be found in MIL-HDBK-828, Laser Range Safety, and TB MED 524, Control of Hazards to Health from Laser Radiation.

**7-7. Maintenance**

a. Only specially trained maintenance personnel will be permitted to work on laser systems.

b. No maintenance work should be performed on laser systems until the power is off and the residual charge in any power supply capacitors has been "bled off". Solid conductor grounding rods (connected first to a reliable ground) shall be utilized to discharge potentially live circuit points. When maintenance must be performed on "live" laser systems, the laser output must be blocked or enclosed.

c. All testing of laser systems will be performed in strictly controlled areas, with barriers and signs as appropriate.

d. Firing of the laser in shop areas should be into a light tight box expressly designed to contain all of the laser output, where feasible.

e. The maintenance officer shall ensure that the number of operating personnel on the site for testing does not exceed that necessary to accomplish the task safely and efficiently.

*f.* Check tests requiring operation of a laser over an extended distance:

(1) Should be conducted in occupied areas only under strict controls.

(2) Insure that the beam can only travel along a tightly controlled path.

g. Maintenance personnel will wear laser protective eyewear as necessary.

h. Maintenance personnel shall familiarize themselves with the safety procedures provided in the maintenance manual for the device and should adhere to any additional precautions outlined in TB 385-4.

**7-8. Warning Signs and Labels**

a. Placarding of potentially hazardous areas will be accomplished according to local SOPs for class 3 and 4 lasers. The signs shown in Figure 1 are examples.

i. A warning label shall be permanently affixed to all class 2, 3 and 4 lasers and laser systems. Laser products manufactured since 1976 already have adequate labeling per 21 CFR 1040.

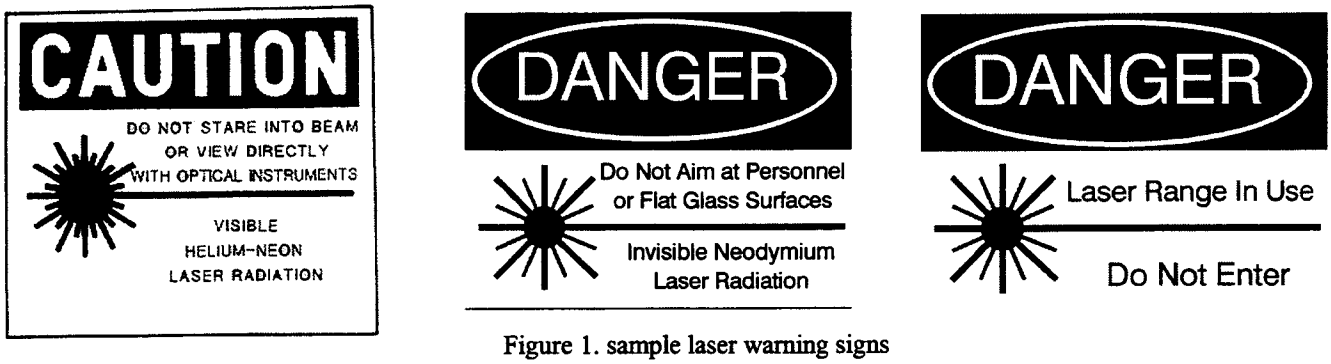


Figure 1. sample laser warning signs

## Chapter 8
## Procedures for Safe Operation of RF Equipment

### 8-1. Exposure Standards

**a.** No practice shall be adopted or operation conducted involving planned exposure of personnel to RF levels in excess of the applicable PEL.

**b.** RF PELs are documented in Department of Defense Instruction (DODI) 6055.11, which adopts the exposure guidelines specified in Institute of Electrical and Electronics Engineers (IEEE) C95.1-1991. The PELs are given in Tables 6-1-1 and 6-2-1 of DODI 6055.11 for both controlled and uncontrolled environments, respectively. A copy of these PELs are included in **appendix E**.

**c.** Controlled environments are areas where exposure levels may exceed the values in Table 6-2-1, but do not exceed the values in Table 6-1-1. Exposures associated with a controlled environment include the following:

**(1)** Exposure that may be incurred by personnel who are aware of the potential for RF exposures as a part of their employment or duties.

**(2)** Exposure of individual who knowingly enter areas where higher levels can reasonably be anticipated to exist.

**(3)** Exposures that may occur incidental to transient passage through such areas.

**d.** Uncontrolled environments are locations where exposure levels are less than the values given in Table 6-2-1. Such environments include living quarters, workplaces, or public areas where there are no expectations that higher RF levels should be encountered. The further reduction in the PELs occurs to control RF levels in areas of domiciles and workplaces that are not associated with RF emitters. That reduction is not based on lessening any known adverse health effect, but is a consensus designed to maintain lower exposure levels outside of well-defined areas.

**e.** Additional RF exposure limits or exposure restrictions are not imposed in case of pregnancy.

**f.** Every incident involving personnel exposure that may exceed the PELs given in Table 6-1-1 (after including adjustments to the PEL, such as, spatial and time averaging, partial-body exposure, etc.) shall be investigated and documented. For personnel exposures occurring at, or above, five times the PEL, the following additional actions are required:

**(1)** RF measurements for the documentation of the RF exposure that may have been received. (This will be conducted by USACHPPM during their formal investigation of the incident).

**(2)** Medical examination and recommendations for medical follow-up.

**(3)** Documentation providing a description of the circumstances surrounding the exposure incident, and recommendations to prevent similar occurrences.

**g.** Installations operating RF emitters shall maintain documentation defining locations categorized as RF controlled environments.

### 8-2. Personal Protective Equipment (PPE)

**a.** PPE should be used only when other control measures do not provide adequate protection, and should not be necessary for normal operation and maintenance of army systems.

**b.** RF protective clothing is not authorized for routine use as a means of protecting personnel from hazardous levels of RF radiation.

**c.** Protective equipment, such as electrically insulated gloves and shoes for protection against RF shock and burn, or for insulation from the ground plane, is authorized where necessary for compliance with the induced current limits of DODI 6055.11.

**8-3. General Precautions**

**a.** Whenever possible, sources will be operated into dummy loads in lieu of free space radiating.

**b.** When the mission requires free space radiation, the radiated beam will not be directed toward occupied areas where the resulting power density levels in those areas will equal or exceed appropriate protection standards. Occupied areas include military and civilian buildings, encampments, elevated structures, etc.

**c.** When the mission requires operating near occupied areas, potentially hazardous radiated beams will be kept at a safe distance from these areas through the use of interlocks, antenna sector blanking, fences, or other positive means.

**d.** Interlocks, antenna sector blanking systems, and other beam restriction devices will be inspected periodically.

**e.** Only authorized personnel will be permitted to setup, adjust, and operate RF systems. Use of these systems will be prohibited for unnecessary or unauthorized purposes or for a period of time beyond that absolutely necessary.

**f.** Personnel will be excluded from the beam path at all points where the power density level of the beam exceeds the PEL. While in operation, the potentially hazardous beam path will be under surveillance to ensure that the area remains clear of personnel.

**g.** Appropriate areas will be posted with signs to indicate the nature of the RF hazard.

**h.** Where warning lights are employed, signs will be posted to inform personnel that the light, when energized, is an indication that a potential hazard is present.

**i.** For training purposes, transmitters will be operated at the minimum output power level necessary to perform the training mission.

**j.** Potentially hazardous wave guides, especially flexible wave guides, will be inspected periodically. Special attention will be given to flexible wave guides for any cracks and to wave guide flanges for proper connection.

**k.** Precautions will be taken to prevent electrical shock hazards to personnel. Do not lean against or touch any doublet or whip antenna when the transmitter is on.

**l.** Ensure that vehicle mounted whip antennas will not come into contact with power lines. When unsure, tie the antenna down to the vehicle.

**m.** Potentially hazardous exposure to x-radiation may result from certain transmitters and transmitter cabinets. These units will be appropriately labeled by the system developer to warn personnel.

**8-4. Maintenance**

**a.**Ensure that all lab and maintenance personnel are familiar with the potential hazards associated with RF systems.

**b.** The use of dummy loads or closed loop configurations is preferred for indoor operations.

**c.** Free space radiation is allowed outside the building for testing purposes. The antenna will be mounted either on the roof or at a height such that the antenna and potentially hazardous beam are inaccessible to personnel.

**d.** Indoor free space radiation is allowed with the written approval of the SRPO. Appropriate RF warning signs will be posted as necessary to warn personnel of potential hazards.

**e.** Observe precautions to prevent the electrical shock and x-radiation hazards associated with RF sources.

**f.** During maintenance/service procedures, do not work on equipment with the power on. When the transmitter and the antenna are widely separated, station one person at the transmitter to ensure that it is not accidentally turned on while maintenance personnel are working on the antenna. If a second person is not available, disconnect the transmitter from the power source and post a sign at the transmitter which prohibits energizing the transmitter.

**8-5. RF Warning Sign**

**a.** The RF hazard warning sign format shown in Figure 2 is a representation of that shown in DODI 6055.11, which is derived from the RF warning symbol published in ANSI C95.2-1982. Variations, to include subdued signs for camouflage or tactical reasons, or to provide improved visibility under certain lighting conditions, are authorized, provided the general layout of the sign remains the same.

**b.** RF hazard warning signs are required at all access points in which levels exceed the controlled environment PELs listed in Table 6-1-1 of DODI 6055.11. Instructional or warning statements should be inserted on the signs. In concert necessary, in response to military operational considerations, provided personnel are informed of possible hazards with safety and occupational health professionals, commanders may waive the requirements for signs, when by other means.

**c.** In areas where access to levels in excess of 10 times the controlled environment PELs may exist, warning signs alone do not provide adequate protection. Other warning devices such as flashing lights, audible signals, barriers, or interlocks, are required depending on the potential risk of exposure.

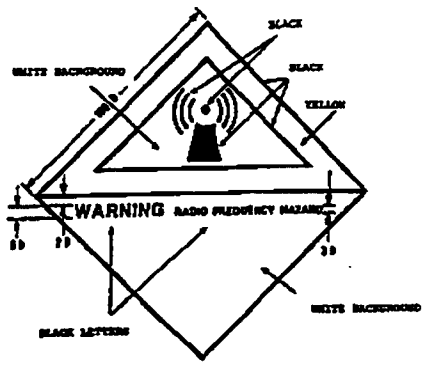


Figure 2. Radio frequency (Rf)warning sign

**Appendix A**
**References**

***Section I***
***Required Publications***

**ANSI Z136.1-1993**
American National Standard for Safe Use of Lasers

**AR 25-400-2**
The Modern Army Record Keeping System

**AR 40-5**
Preventive Medicine

**AR 40-14**
Control and Record Keeping Procedures for Exposure to Ionizing Radiation and Radioactive Material

**AR 40-400**
Patient Administration

**AR 200-2**
Environmental Effects of Army Actions

**AR 385-11**
Safety: Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety)

**AR 385-40**
Accident Reporting and Records

**AR 385-63**
Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat

**DOD 4160.21-M**
Defense Utilization and Disposal Manual

**DODI 6055.11**
Protection of DOD Personnel from Exposure to Radio frequency Radiation and Military Exempt Lasers

**IEEE C95.1-1991**
IEEE Standard for Safety Levels with Respect to Human Exposure to Radio frequency Electromagnetic Fields, 3 kHz to 300 GHz

**OTSG Policy Memorandum, 11 April 1994**
Surveillance of Laser and Radio frequency Radiation Personnel

**TB 43-0116**
Identification of Radioactive Items in the Army

**Title 10 CFR**
Energy

**Title 39 CFR**
Postal Service

**Title 49 CFR**
Transportation

**U.S. Postal Publication 6**
Radioactive Materials.

**Atomic Energy Act**

***Section II***
***Related Publications***
(A related publication is merely a source of additional information. The user does not have to read it to understand this regulation.)

**AMCCOM P 385-1**
Handbook for Disposal of Unwanted Radioactive Material

**ANSI C95.2**
American National Standard Radio Frequency Radiation Hazard Warning Symbol

**AR 700-64**
Radioactive Commodities in the DOD Supply System

**FM 8-50**
Prevention and Medical Management of Laser Injuries

**MIL-HDBK-828**
Laser Range Safety

**TB MED 523**
Control of Hazards to Health from Microwave and Radio frequency Radiation and Ultrasound

**TB MED 524**
Control of Hazards to Health from Laser Radiation

**TB 43-0133**
Hazard Criteria for CECOM Radio frequency and Optical Radiation Producing Equipment

**TB 43-0216**
Safety and Hazard Warnings for Operation and Maintenance of TACOM Equipment

**TB 43-180**
Calibration Requirements for the Maintenance of Army Materiel

**TB 385-4**
Safety Requirements for Maintenance of Electrical and Electronic Equipment

**Title 21, Code of Federal Regulations, Part 1040**
Performance Standards for Light-Emitting Products

***Section III***
***Forms***

**NRC 3**
Notice to Employees

**Section 206**
Public Law 93-438

## APPENDIX B

### Individually Controlled Radioactive Items of Supply

| *Designation & NSN* | *Use* | *Radio nuclide Activity and Half-life* | *Frequency of Leak Test* | *Reference* |
|---|---|---|---|---|
| AN/UDM-2 6665-00-179-9037 RADIAC Calibrator | Calibrated and sealed beta source for RADIAC meters: IM-9E/PD, IM-93()/UD, IM-147()/PD, IM-174()/PD, RADIAC sets: AN/PDR-27(), AN/PDR-60, AN/VDR-2, AN/PDR-77. | Sr-90/Y-90, 180 milli-curies, 28.6 years | 6 months | TM 11-6665-227-12 |
| AN/UDM-6 6665-00-767-7497 RADIAC calibrator. | Calibrated alpha source for RADIAC sets: AN/PDR-56F, AN/PDR-60. | Pu-239 1.4 micro-curies, 24,131 years. | 3 months | TM 11-6665-248-10 |
| MC-1 6635-01-030-6896 Campbell Pacific Nuclear Moisture Density Tester | Calibrated and sealed gamma and fast neutron source For Measuring asphalt, moisture, and soil density. | Cs-137, 10 milli-curies, 30.17 years and Am-241, 50 milli-curies, 432.2 years | 6 months | TM 5-6635-386-12&P |

## APPENDIX C

### Licenses, Licensees, and Radioactive Material Control Points

| *Item Designation NSN NRC License No.* | *Report Incident to these NRC Licensees:* | *Send Report of Movement, Consolidated Leak Test or Inventory to:* | *If DA installation lacks ability to evaluate samples, send samples to:* |
|---|---|---|---|
| AN/UDM-2<br>6665-00-179-9037<br>29-01022-14 | Commander<br>US Army<br>Communications-<br>Electronics | Commander<br>US Army<br>Communications-<br>Electronics Command | Commander<br>US Army<br>Communications-<br>Electronics-<br>Command |
| AN/UDM-6<br>6665-00-767-7497<br>29-01022-14 | Command<br>ATTN: AMSEL-SF,<br>Fort Monmouth,<br>07703-5024 | ATTN: AMSEL-SF-RE<br>Fort Monmouth, NJ<br>07703-5024 | ATTN: AMSEL-SF-RE<br>Fort Monmouth, NJ<br>07703-5024 |
| Telephone: Commercial: (732) 427-4427/3112, (732) 532-0084<br>DSN: 987-4427/3112, 992-0084 | | | |
| MC-1<br>6635-01-030-6896<br>21-01222-05 | Commander<br>US Army<br>Tank-<br>automotive &<br>Armaments<br><br>Command<br>ATTN: AMSTA-<br>CS-CZ<br>Warren, MI<br>48397-5000 | Commander<br>US Army<br>Tank-<br>automotive &<br>Armaments<br><br>Command<br>ATTN: AMSTA-<br>CS-CZ<br>Warren, MI<br>48397-5000 | Chief<br>US Army<br>Ionizing<br>Radiation<br>Dosimetry<br><br>Center<br>ATTN: AMSMI-<br>TMDE-SR-D<br>BLDG 5417<br>Redstone<br>Arsenal, AL<br>35898-5400 |
| Telephone: Commercial: (810) 574-7635/6194, (205) 876-7634/7674<br>DSN: 786-7635/6194, 746-7634/7674 | | | |

**APPENDIX C** (CONT 'D)

| *Item Designation NSN NRC License No.:* | *Report incident to these NRC Licensees:* | *Send report of Movement, Consolidated Leak Test or Inventory to:* | *If DA installation lacks ability to evaluate samples, send samples to:* |
|---|---|---|---|
| M8A1<br>6665-01-105-5623<br>12-00722-13 | Director,<br>Armament &<br>Chemical<br>Acquisition<br>& Logistics<br>Activity,<br>ATTN: AMSTA-AC-SF<br>Rock Island, IL<br>61299-7630 | Director<br>Armament &<br>Chemical<br>Acquisition<br>& Logistics<br>Activity,<br>ATTN: AMSTA-AC-SF<br>Rock Island, IL<br>61299-7630 | Commander<br>Rock Island,<br>ATTN: SIORI-<br>SEM-L<br>Rock Island, IL<br>61299-5000 |
| M43A1<br>12-722-357-8140.1<br>12-00722-13 | Telephone: Commercial: (309) 782-2965/2962/2995/628<br>DSN: 793-2965/2962/2995/628 | | |
| Chemical Agent<br>Monitor<br>6665-01-199-4153<br>12-00722-14 | | | |
| Improved Chemical<br>Agent Monitor<br>6665-01-357-8502<br>12-00722-14 | | | |

## APPENDIX D

### Addresses and Emergency Telephone Numbers

| *Emergency Point of Contact:* | *Address:* | *Office:* | *DSN:* | *Commercial:* |
|---|---|---|---|---|
| NGB RCO* | Commander<br>US Army Communications-Electronics Command<br>ATTN: AMSEL-SF-RE<br>Fort Monmouth, NJ 07703-5024 | DSRM<br>Duty Officer | 987-3112<br>992-1100 | (732) 427-3112<br>(732) 532-1100 |
| ARNG* | Chief Safety Office<br>National Guard Bureau<br>ATTN: NGB-AVN-SO<br>ARNG Readiness Center<br>Arlington, VA 22204-1382 | Safety Office<br>Operations Center | 327-7730<br>327-9350 | (703) 607-7730<br>(703) 607-9350 |
| Chief | Chief,<br>National Guard Bureau<br>ATTN: NGB/CC<br>1411 Jefferson Davis Highway<br>Arlington, Virginia 22202-3231 | Office of the Chief | 327-2200 | (703) 607-2200 |
| Army Safety Office* | Army Safety Office<br>ATTN: DACS-SF<br>200 Army Pentagon<br>Washington, DC 20310-0200 | Chief of Staff<br>Operations Center | 225-7291<br>227-0218 | (703) 695-7271<br>(703) 697-0218 |
| USACHPPM | Commander, USACHPPM<br>ATTN: MCHB-DC-ORF or<br>ATTN: MCHB-DC-OLO<br>Aberdeen Proving Ground, MD 21010-5422 | RF Program<br>Laser Program | 584-3353<br>584-3932 | (410) 436-3353<br>(410) 436-3932 |

- During normal duty hours, call the office listed. After 1700 hours, call the listed Duty Officer/Operations Center.

## APPENDIX E

### TABLE 6-1-1. PELS FOR CONTROLLED ENVIRONMENTS

A. RF EMF

| Frequency Range (f) (MHz) | Electric Field (E) (V/m) | Magnetic Field (H) (A/m) | Power Density (S) ($mW/cm^2$) | Averaging Time ($T_{avg}$) (minutes) $E^2$, $H^2$, S |
|---|---|---|---|---|
| 0.003 – 0.1 | 614 | 163 | ($10^2$, $10^6$) | 6 |
| 0.1 – 3.0 | 614 | 16.3/f | ($10^2$, $10^4/f^2$) | 6 |
| 3 – 30 | 1842/f | 16.3/f | ($900/f^2$, $10^4/f^2$) | 6 |
| 30 – 100 | 61.4 | 16.3/f | (1.0, $10^4/f^2$) | 6 |
| 100 – 300 | 61.4 | 0.163 | 1.0 | 6 |
| 300 – 3000 | | | f/300 | 6 |
| 3000 – 15000 | | | 10 | 6 |
| 15000 - 300000 | | | 10 | $616000/f^{1.2}$ |

B. RF INDUCED CURRENT RESTRICTIONS

| Frequency Range (f) (MHz) | Maximum Current Through Both Feet (mA) | Maximum Current Through Each Foot (mA) | Contact Current (mA) |
|---|---|---|---|
| 0.003 – 0.1 | 2000f | 1000f | 1000f |
| 0.1 – 100 | 200 | 100 | 100 |

C. PULSED RF FIELDS

| Frequency Range (f) (MHz) | Peak Electric Field (E) (kV/m) | Peak Power Density/Pulse for Pulse Durations < 100 msec ($mW/cm^2$) |
|---|---|---|
| 0.1 – 300000 | 100 | $(PEL)(T_{avg})/(5)$(pulse width) |

D. PARTIAL-BODY EXPOSURES

| Frequency Range (f) (MHz) | Peak Value of Mean Squared Field ($V^2/m^2$ or $A^2/m^2$) | Equivalent Power Density ($mW/cm^2$) |
|---|---|---|
| 0.1 – 300 | $< 20E^2$ or $20H^2$ | |
| 300 – 6000 | | < 20 |
| 6000 – 96000 | | $< 20(f/6000)^{0.25}$ |
| 96000 – 300000 | | 40 |

## APPENDIX E (CONT'D)

### TABLE 6-2-1. PELS FOR UNCONTROLLED ENVIRONMENTS

A. RF EMF

| Frequency Range (f) (MHz) | Electric Field (E) (V/m) | Magnetic Field (H) (A/m) | Power Density (S) ($mW/cm^2$) | Averaging Time ($T_{avg}$) (minutes) $E^2$, S or $H^2$ |
|---|---|---|---|---|
| 0.003 – 0.1 | 614 | 163 | ($10^2$, $10^6$) | 6 6 |
| 0.1 – 1.34 | 614 | 16.3/f | ($10^2$, $10^4/f^2$) | 6 6 |
| 1.34 – 3.0 | 823.8/f | 16.3/f | ($180/f^2$, $10^4/f^2$) | $f^2/.3$ 6 |
| 3 – 30 | 823.8/f | 16.3/f | ($180/f^2$, $10^4/f^2$) | 30 6 |
| 30 – 100 | 27.5 | $158.3/f^{1.668}$ | ($0.2$, $9.4x10^5/f^{3.336}$) | 30 $.0636f^{1.337}$ |
| 100 – 300 | 27.5 | 0.0729 | 0.2 | 30 30 |
| 300 – 3000 | | | f/1500 | 30 |
| 3000 – 15000 | | | f/1500 | 90000/f |
| 15000 - 300000 | | | 10 | $616000/f^{1.2}$ |

B. RF INDUCED CURRENT RESTRICTIONS

| Frequency Range (f) (MHz) | Maximum Current Through Both Feet (mA) | Maximum Current Through Each Foot (mA) | Contact Current (mA) |
|---|---|---|---|
| 0.003 – 0.1 | 900f | 450f | 450f |
| 0.1 – 100 | 90 | 45 | 45 |

C. PULSED RF FIELDS

| Frequency Range (f) (MHz) | Peak Electric Field (E) (kV/m) | Peak Power Density/Pulse for Pulse Durations < 100 msec ($mW/cm^2$) |
|---|---|---|
| 0.1 – 300000 | 100 | (PEL)($T_{avg}$)/(5)(pulse width) |

D. PARTIAL-BODY EXPOSURES

| Frequency Range (f) (MHz) | Peak Value of Mean Squared Field ($V^2/m^2$ or $A^2/m^2$) | Equivalent Power Density ($mW/cm^2$) |
|---|---|---|
| 0.1 – 300 | $< 20E^2$ or $20H^2$ | |
| 300 – 6000 | | 4 |
| 6000 – 96000 | | f/1500 |
| 96000 – 300000 | | 20 |

## GLOSSARY

*Section I*
*Abbreviations*

**ALRPO**
Alternate Local Radiation Protection Officer

**ANSI**
American National Standards Institute

**ARNG**
Army National Guard

**ASRPO**
Alternate State Radiation Protection Officer

**ALRPO**
Alternate Local Radiation Protection Officer

**CECOM**
U.S. Army Communications-Electronics Command

**CFR**
Code of Federal Regulations

**DA**
Department of the Army

**DARA**
Department of the Army Radiation Authorization

**DOD**
Department of Defense

**DODI**
Department of Defense Instruction

**DOT**
Department of Transportation

**ICRI**
Individually Controlled Radioactive Item

**IEEE**
Institute of Electrical and Electronics Engineers

**IRPP**
Ionizing Radiation Protection Program

**LRPO**
Local Radiation Protection Officer

**LRSO**
Laser Range Safety Officer

**LSO**
Laser Safety Officer

**MSC**
Major Subordinate Command

**mrem/hr**
millirem per hour

**NGB**
National Guard Bureau

**NRC**
U.S. Nuclear Regulatory Commission

**NRPP**
Nonionizing Radiation Protection Program

**NSN**
National Stock Number

**OD**
Optical Density

**PEL**
Permissible Exposure Limit

**RCO**
Radiation Control Officer

**RF**
Radio frequency

**RFSO**
Radio frequency Safety Officer

**RPO**
Radiation Protection Officer

**SOP**
Standing Operating Procedures

**SRPO**
State Radiation Protection Officer

**USACHPPM**
U.S. Army Center for Health Promotion and Preventive Medicine

**USAMC**
U.S. Army Materiel Command

**USPS**
U.S. Postal Service

***Section II***
***Terms***

**Activity** *(Radioactivity)*
The number of nuclear transformations occurring in a given quantity of material per unit time. The basic unit of measure is the Becquerel (Bq).

**Attenuation**
A term used to denote a decrease in the power or energy density level of any electromagnetic radiated field as it passes through an absorbing and/or scattering medium.

**Authorized land burial site**
U.S. NRC approved site designated by CG, IOC, as the place radioactive waste will be sent for land burial.

**Aversion Response**
Closure of the eyelid, or movement of the head, to avoid an exposure to bright light.

**Becquerel** *(Bq)*
The basic unit of activity.

**Closed Loop Configuration**
The configuration of an RF emitter where both the output and termination of the radiation are contained within the source system. In this configuration, there is no chance of any free space radiation.

**Controlled Environment**
Locations where RF exposures may exceed the levels given in Table 6-2-1 of DODI 6055.11, but do not exceed the levels in Table 6-1-1, or an area where the occupancy and activity of those within are subject to control and supervision for the purpose of protection from laser radiation hazards.

**Continuous Wave Laser**
A laser which emits energy for a period in excess of 0.25 second.

**Curie** *(Ci)*
A measurement unit of activity (radioactivity). One Ci equals 3.7E10 disintegrations per second.

**Diffuse Reflection**
Takes place when different parts of a beam incident on a surface are reflected over a wide range of angles.

**Dummy Load**
Any device introduced into an RF system for the purpose of absorbing RF radiation.

**Electromagnetic Radiation**
The propagation of energy in the form of varying electric and magnetic fields through space.

**Hertz (Hz)**
The unit for expressing frequency. One hertz equals one cycle per second.

**Incidental Laser Worker**
Individuals working in a laser area whose work makes it possible, but unlikely, that they will be exposed to laser energy sufficient to damage their eyes or skin. Examples include laser custodial personnel, military personnel during field exercises, and clerical and supervisory personnel not working directly with laser devices.

**Individually Controlled Radioactive Items**
Those radioactive items identified in Appendix B. The integrity and location of an ICRI shall be known by the licensee, or designated agent (control points), at all times.

**Intrabeam Viewing**
Viewing the laser source from within the direct beam or a specular reflection of the beam.

**Ionizing radiation producing devices**
Devices that produce ionizing radiation when energized. Examples are x-ray machines, linear accelerators, electron microscopes, cyclotrons, and radiofrequency generators that use klystron, magnetron, or other tubes that produce x-rays.

**Ionizing radiation**
Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly in its passage through matter. For purposes of this regulation, alpha and beta particles, gamma rays, x-rays, and neutrons are examples of ionizing radiation. Ionizing radiation does not include sound or radiowaves, visible, infrared, or ultraviolet light or lasers.

**Irradiance**
Power per unit area on a given surface, in units of watts per square centimeter. The term irradiance is typically associated with laser radiation.

**Joule (J)**
A unit of energy normally used in describing a single pulsed output of a laser.

**Laser**
An acronym for Light Amplification by Stimulated Emission to Radiation. It is a source of intense, coherent and directional optical radiation. Asusedin this regulation, laser denotes either the laser source itself or an entire system encompassing such a source.

**Laser Range Safety Officer (LRSO)**
An individual associated with a laser range operation who is responsible for assuring the implementation of control measures required for the particular range operation. This individual need not be located within the Safety Office of the installation or activity.

**Laser Safety Danger Zone**
The ground area that requires control during laser operation. Unauthorized personnel are not permitted and laser eye protection is required for personnel who may engage in intrabeam viewing within this area.

**Laser Safety Officer (LSO)**
An individual, designated by the commander, who is qualified by either education or experience to make informed judgments regarding safety control measures needed for laser operations.

**Laser Worker**
Individuals who routinely work in laser environments. Examples would be research and development personnel, maintenance/repair personnel, system training personnel, and personnel using lasers for medical treatment.

**Leak test**
Test performed periodically (quarterly, semi-annual, etc.) to verify the physical integrity of a sealed radioactive source.

**Licensed material**
Source, special nuclear or by-product material received, stored, possessed, used, or transferred under a general or specific license issued by the NRC, an Agreement State, or a DA Radiation Authorization.

**Life cycle controls**
The composite of all management actions to ensure that the hazards of radioactive material are kept to a minimum. These controls are set for each phase of the life cycle to ensure the affects of radiation on personnel and the environment are kept within acceptable limits.

**Limited quantity of radioactive material**
Radioactive materials whose activity per package does not exceed the limits specified in 49 CFR 173.423.

**Medical use**
The use of radioactive material (by-product, etc.), or the radiation from radioactive material, on humans or animals for diagnostic procedures or treatment.

**Microcurie** *(uCi)*
One-millionth of curie (3.7E04 disintegrations per second or 2.22E06 disintegrations per minute).

**Monitoring**
Routine measurement of the radiation level and/or contamination level of an area, building, room, package or equipment.

**Monitoring** *(personnel)*
Measuring any part of an individual including the body, external or internal, excretions, or any part of the clothing for the purpose of determining radiation exposure or contamination.

**Nominal Ocular Hazard Distance (NOHD)**
For direct intrabeam viewing, the minimum distance beyond which an unprotected individual may view the beam and can be exposed repeatedly without injury, provided the individual does not view the beam through unfiltered optical devices. When viewing the beam through a magnifying device, the hazardous range is greatly increased. For this reason NOHDs are specified for unaided viewing and optically aided viewing.

**Nonionizing Radiation**
Electromagnetic radiation that does not have enough energy to ionize atoms or molecules.

**Nonionizing Radiation Protection Program (NRPP)**
A formal program implemented to ensure the safe use of laser and RF devices, and to minimize personnel exposure to radiation emitted by these devices.

**Optical Density (OD)**
A logarithmic expression for the attenuation produced by an attenuating medium, such as an eye protection filter.

**Overexposure**
Any human exposure to laser or RF radiation which exceeds the established PELs.

**Permissible Exposure Limit (PEL)**
The PEL is that limit up to which there is no expectation that any adverse health effects will occur from exposure, even under repeated or long-term exposure conditions.

**Power Density**
Radiated power per unit area, usually expressed in units of Watts per square meter or milliwatts per square centimeter. The expression power density is usually associated with RF fields.

**Qualified person**
A person who has had formal training in the following subjects to the level required for the appointed position:

**a.** Basic principles of radiation, biological effects and radiation protection methods.

**b.** Leak testing, survey and inventory requirements for the ICRI.

**c.** Transportation requirements for radioactive materials.

**d.** Federal and Army regulations pertaining to safe operation, storage and movement of radioactive materials and nonionizing radiation producing devices.

**Radiant Exposure**
The energy per unit area incident upon a given surface in a given time interval. Expressed in Joules per square centimeter, it is commonly used to express exposure dose to pulsed laser radiation.

**Radiation Protection Officer**
A person appointed by the commander to give advice on the hazard of ionizing radiation and to supply effective ways to control these hazards.

**Radiation Control Officer**
An individual appointed by each major Army commander to manage the radiation protection program for the major command.

**Radioactive article**
Any manufactured device, such as an instrument, clock, electronic tube, or apparatus, or similar device having radioactive material as a component part.

**Radioactive Material Control Point** *(RMCP)*
Any Army element (including the RCO) that has been designated by a major Army commander to control radioactive items within the command.

**Radioactive material**
Any material or combination of materials that emit ionizing radiation. This includes natural elements such as radium, fission by-products, and accelerator produced radionuclides.

**Radioactive commodity**
An item of Government property composed in whole or in part of radioactive materials and to which a national stock number (NSN) or part number has been assigned. A radioactive commodity is any item in the DOD Supply System that contains radioactivity equal to or in excess of the quantities listed in 10 CFR, Part 20 Appendix C, or the specific activity of the radioactive part is greater than 0.002 micro-curies per gram of radioactive material (49 CFR, Part 173.403).

**Radioactive waste**
Consists of any of the following:

**a.** Property contaminated to the extent that decontamination is economically unsound.

**b.** Surplus radioactive material whose sale, transfer, or donation is prohibited.

**c.** Surplus radioactive material that is determined to be unwanted after being advertised as surplus.

**d.** All waste that is radioactive due to production, possession, or use of radioactive material.

**Radio frequency (RF)**
The RF region of the electromagnetic spectrum. It is defined as extending from 3 kHz to 300 GHz.

**Radio frequency Safety Officer (RFSO)**
An individual, designated by the commander, who is qualified by either education or experience to make informed judgments regarding safety control measures needed for RF operations.

**Report, survey**
A written record of the data, analysis, evaluation, disposition of radioactive materials and radiation levels, required actions, and recommendations associated with performing a radiation survey.

**Sealed source**
Any radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent the release or dispersal of such radioactive material under severe conditions. All sealed sources are certified by the US Nuclear Regulatory Commission.

**Specular Reflection**
A mirror-like reflection.

**State Radiation Protection Officer (SRPO)**
An individual, designated by the commander, who is qualified by education and experience to implement the ionizing and nonionizing radiation protection programs within the State or Territory for which they are appointed.

**Survey** *(radiation)*
A measure of the radiation incident to the use, storage, handling and shipment of radioactive material or ionizing radiation producing equipment. The measurement encompasses radiation dose rates and the levels of fixed and removable contamination, as appropriate.

**Uncontrolled Environment**
Locations where RF exposures do not exceed the PELs in Table 6-2-1 of DODI 6055.11.

**Watt (W)**
A unit of power equivalent to 1 joule per second. Used principally to describe the output of continuous wave lasers and the output of RF devices.

**Wavelength**
The distance in the direction of propagation between two successive points of a periodic wave which have the same phase.