***BY ORDER OF THE COMMANDER***
***MCONNELL AIR FORCE BASE***

***MCONNELL AIR FORCE BASE***
***INSTRUCTION 48-104***

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***Aerospace Medicine***

***INSTALLATION***
***RADIATION PROTECTION PROGRAM***

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

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This publication implements Air Force Manual (AFMAN) 48-148, *Ionizing Radiation Protection;* AFMAN 40-201, *Radioactive Materials (RAM) Management*; Air Force Specialty Code 4B051 Bioenvironmental Engineer's Guide to Ionizing Radiation; DAFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*; T.O. 33B-1-1, *Nondestructive Inspection Methods, Basic Theory*; AFI 48-139, *Laser and Optical Radiation Protection Program*; American National Standards Institute Z136.1, *Safe Use of Lasers*; AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*; and the ALARA (As Low As Reasonably Achievable) concept, 10 C.F.R. 20.1003, for exposures to ionizing radiation (e.g., RAM or radiation producing devices (RPDs)) at McConnell AFB. It gives guidance for all commanders, radiation safety officers (RSO), laser safety officers (LSO), unit radiation safety officer (URSO), contracting office personnel, and all other personnel whose duties involve potential exposure to ionizing and non-ionizing radiation. This publication applies to all civilian employees and uniformed members of the Department of Defense where personnel have duties that involve performing or supervising work in areas where exposures to ionizing and non-ionizing radiation may occur. It also applies to persons not occupationally exposed (members of the general public) to the extent that it addresses controls to protect the public from the potential hazards from sources of ionizing and non-ionizing radiation owned and/or operated by the Air Force. This instruction does not apply to the exposure of medical patients during diagnostic or therapeutic procedures, nor does it apply to exposures of personnel to ionizing radiation resulting from the employment of nuclear or thermonuclear weapons in combat. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 through appropriate chain of

command. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFI 33-322, *Records Management and Information Governance Program*, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). This publication requires the collection and/or maintenance of information protected by the Privacy Act of 1974 authorized by Department of Defense Directive (DoDD) 5400.11, *DoD Privacy Program*. The Systems of Records Notice (SORN) for the United States Air Force Master Radiation Exposure Registry is F044 AF SG O. The authority to collect and maintain the records prescribed in this publication is DODI 6055.08, *Occupational Ionizing Radiation Protection Program*. Compliance with the attachments in this publication is mandatory.

## *SUMMARY OF CHANGES*

This document has been substantially revised and must be completely reviewed. Major changes include updates from newly published regulations including: AFMAN 48-148, *Ionizing Radiation Protection,* AFI 48-139, *Laser and Optical Radiation Protection Program,* AFMAN 40-201, *Radioactive Materials (RAM) Management,* DAFMAN 48-125, *Personnel Ionizing Radiation Dosimetry* and term change from radio frequency radiation (RFR) to electromagnetic field radiation (EMF).

## 1. Overview.

1.1. Purpose. The purpose of the base radiation protection program is to establish protection requirements necessary for the safe use of radiation producing devices (RPDs) and material. A properly managed radiation protection program will minimize the incidence of exposures to radiation to workers and the public, ensure a knowledgeable workforce exists, and maintain compliance with all federal, DoD, Air Force, and state regulations.

1.2. Scope. This instruction provides the responsibilities and requirements for an effective radiation protection program for those who work with or work around ionizing or non- ionizing radiation. In addition, it provides procedures to ensure the public's safety when near radiation. Ionizing radiation requirements apply to x-ray emitting devices, all items on McConnell AFB requiring a radioactive permit or classified as a generally licensed device (GLD), and all areas that procure/transport/store such items. Non-ionizing radiation requirements apply to class 3B lasers, class 4 lasers, and electromagnetic frequencies of 3 kHz to 300 GHz.

## 2. Responsibilities.

2.1. Installation Radiation Safety Officer (IRSO):

2.1.1. Serves as the installation commander's single point of contact for all radiation safety matters. IRSO investigates, evaluates, initiates corrective action, and reports on defects or noncompliance items relating to substantial safety hazards involving RAM or RPDs.

2.1.2. Terminates any operation which, in the opinion of the IRSO, poses a substantial radiation hazard to personnel or the environment. A report of such actions will be made to the installation commander.

2.1.3. Conducts investigation of incidents of alleged or actual overexposures to radiation.

2.1.4. Provides expert consultation, advice, assistance, and direction to base agencies (i.e. antiterrorism working group, threat working group, fire department, incident commander, emergency management working group, and Environment, Safety, and Occupational Health Council (ESOHC) on the hazards associated with radiation and the methods to control these hazards, as needed. Briefs at least annually the ESOHC, or equivalent, regarding use of RAM on the installation.

2.1.5. Reviews design plans for facilities to be used for RAM or RPDs that could require shielding and provide preliminary hazard evaluations.

2.1.6. Provides oversight of all permit RSOs, Unit Radiation Safety Officer (URSOs), and radiation programs to ensure all federal, DoD, Air Force, installation, and state requirements relating to radiation safety are met.

2.1.7. Conducts annual reviews of written RAM template permit policies and conducts annual permit audits. Provides results to permitees.

2.1.8. Provides Radioisotope Committee (RIC) secretariat approved template permit RSO training and tests to permit RSO candidates. Provides names of those individuals who pass the test to the RIC secretariat.

2.1.9. Ensures URSOs are assigned and annually trained for all units that may use, possess, or come in contact with ionizing/non-ionizing radiation.

2.1.10. Manages and controls the receipt, shipment, transfer, and disposal/recycling of radioactive items and wastes, to include proper packaging and storage by installation organizations.

2.2. Bioenvironmental Engineering Flight (BEF):

2.2.1. Coordinates with Civil Engineering Emergency Management and Fire Department on base emergency response plans and checklists related to radiation.

2.2.2. Provides radiation safety training and materials for URSOs and for users of RAM and RPDs through as low as reasonably achievable (ALARA) training. Approve radiation safety training plans for training provided by others, such as permit RSOs or URSOs.

2.2.3. Conducts the installation radiation dosimetry program and non-ionizing radiation programs in accordance with federal, DoD, Air Force, and state requirements.

2.3. Unit Commanders

2.3.1. Delegate the authority to the permit RSO or URSO to suspend operations involving RAM that pose a significant health risk to personnel, are in clear violation of regulations or requirements, or can negatively impact Air Force operations, materials or real estate.

2.3.2. Provide immediate notification to the IRSO of suspected, attempted or actual theft or sabotage of RAM, to include any situation where the potential for collateral damage exists due to threats in proximity to RAM.

2.3.3. Appoints, in writing, the URSO to be responsible for radiation safety within the unit, if unit owns, operates, or works around radiation-producing devices or items, to include lasers and EMF emitters. Provide a copy of the appointment letter to BE/IRSO.

2.3.4. Coordinate with BE/IRSO prior to receiving, possessing, using, distributing, storing, transporting, transferring, or disposing of any RAM, or any commodity or equipment containing RAM, and for requirements document review/validation for any contracting actions involving the aforementioned (to include all design reviews and work order requests at least 30 days in advance of work involving potential use, movement, or disposal of RAM).

2.3.5. Provide required resources for the permit RSO or URSO to maintain compliance with this instruction.

2.4. Permittees:

2.4.1. Be ultimately responsible for complying with all permit conditions, AFIs/manuals, and applicable federal regulations and also meet the following criteria, unless otherwise determined by the RICS:

2.4.1.1. Is a supervisor in the organization in which RAM is used, with operational and administrative control (e.g., unit commander, director, department chair, division chief ) over the PRSO and all users; and

2.4.1.2. Is not the IRSO, PRSO, a contractor, or user of the RAM authorized by the same permit

2.4.2. Designate a qualified PRSO to manage the permitted RAM; with the authority, in writing, to suspend any operations that poses a significant health risk to personnel or the general public, a clear violation of regulations, or a high risk of negative impact to USAF operations, material or real estate.

2.4.2.1. Submit their qualifications for approval by the RICS. For Template Permits, this requirement is satisfied by signing page two of the Request for Template Permit Action form.

2.4.3. Appoint a chairperson to oversee the Permit Radiation Safety Committee, if required, when the Permittee chooses not to fill the position. The chairperson cannot be the PRSO.

2.4.4. Approve the Radiation Safety Committee (RSC) charter and membership, when required.

2.5. Permit Radiation Safety Officer:

2.5.1. Appointed, in writing, by unit commander (permittee) of squadron owning template permit. Provide a copy of letter of appointment to BE/IRSO.

2.5.2. Certified by BE/IRSO to be permit RSO in accordance with RIC secretariat template permit RSO training and test requirements.

2.5.3. Ensures radiation safety and compliance for the use of RAM for which a specific Air Force RAM template permit has been issued by the Air Force RIC.

2.5.4. Ensures permit RAM is not transported or transferred to another organization without prior coordination with BE/IRSO.

2.5.5. Develops, in coordination with BE/IRSO, written policy for permitted RAM as required by AFMAN 40-201, Radioactive Materials (RAM) Management.

2.5.6. Maintains a binder that includes all applicable permit documentation (e.g., appointment letter, amendments, inspection reports, leak test results, written policy/procedures) and important contact information (see **Attachment 3**).

2.5.7. Reports accidents or incidents involving RAM to BE/IRSO.

2.6. Unit Radiation Safety Officer (URSO):

2.6.1. Must be appointed, in writing, by the unit commander to ensure compliance with applicable regulations. The URSO appointment letter required by Wing Safety meets this requirement. This individual should have the authority to execute the necessary actions to ensure compliance. The appointed individual shall work with the BE/IRSO to ensure compliance with applicable regulations.

2.6.2. Responsible for units owning any GLDs.

2.6.2.1. Shall preserve all labels affixed to the device recognizing the radiation isotope and follow all instructions on the label.

2.6.2.2. Will ensure the device is not transferred to another organization until transfer is approved and coordinated with BE/IRSO.

2.6.2.3. Will ensure maintenance only be completed by the manufacturer of the product. If shipping of device is required, will contact BE/IRSO.

2.6.2.4. Will ensure that GLDs are properly disposed.

2.6.3. Responsible for lasers and EMF.

2.6.3.1. Responsible for all safety requirements regarding hazard class 3B and 4 lasers operated by their unit, to include conducting and documenting initial and annual training regarding the proper use of lasers and the hazards of lasers. BE/ILSO can assist with development of training material.

2.6.3.2. Assists the unit commander in developing policies and procedures for non-ionizing radiation in accordance with federal, DoD, and Air Force regulations.

2.6.3.3. Reports all suspected laser or EMF exposures to the unit commander and installation radiation/laser safety officer.

2.7. Installation Contracting Office:

2.7.1. Ensures that all contracts contain the terms and conditions the BE/IRSO has determined must be in the contract in order to be in compliance with all applicable statutes, regulations and instructions for managing RAM in the Air Force and acquisition of FDA-compliant lasers. Contractors will include a current USNRC Materials License (NRC Form 374), leak test report if applicable for the contractor's equipment, equipment information (serial no. calibration dates, etc.), people certified to use the equipment including their training dates and Kansas Radioactive Materials License. This will include the requirement that non-Air Force organizations, including other DoD organizations, Department of Energy (DoE) organizations, DoE prime contractors and other contractors that need to use RAM either licensed by the Nuclear Regulatory Commission (NRC) or an Agreement State on the installations, have one of the following:

2.7.1.1. An NRC or agreement state license. A copy of the NRC Form 241, NRC Reciprocity Form or equivalent, must be an adjunct to the agreement state license for those areas of exclusive federal jurisdiction in agreement states. For those areas of concurrent or proprietary jurisdiction in an agreement state, then the respective agreement state license is a valid authorization.

2.7.1.2. A valid US Navy RAM permit.

2.7.1.3. Written certification from DoE organizations or DoE prime contractors that they are exempt from NRC license requirements.

2.7.1.4. Written approval from BE/IRSO to transfer, transport, or use temporary storage areas for RAM on the installation.

2.7.2. Will inform requiring agencies of their responsibility during design reviews and work order requests to submit formal approval prior to allowing work to commence on contracts for which they oversee. Without prior written approval from BE/IRSO work requests will be denied.

2.7.3. In coordination with BE/IRSO, and in accordance with the terms and conditions of the contract, suspend contractor operations that violate AFI 40-201, Radioactive Materials (RAM) Management, a permit or license, federal, or state regulations until corrective action is taken.

2.8. 22 LRS/LGRDD (Cargo Movement):

2.8.1. Prepares and transports RAM shipments in accordance with 10 CFR 71, Packaging and Transportation of Radioactive Material; 49 CFR, Transportation; and Defense Transportation Regulation (DTR) DoD 4500.9-R-Part II, Cargo Movement, as applicable.

2.8.2. Ensures personnel performing transportation operations (e.g., receipt, shipment, packaging) of RAM comply with training requirements specified in 49 CFR 172.704 and DTR DoD 4500.9-R-Part II.

2.8.3. Does not transfer any RAM to units on the installation without prior coordination with IRSO. Permitted RAM will not be transferred to any organizations without an up-to-date permit, a permit RSO, or the proper identification of radionuclide/quantities of material/devices as authorized on the permit.

2.8.4. Develops and implements procedures to prevent the unauthorized transfer of RAM/items of supply containing RAM/or any item of suspect through the Defense Logistics Agency Disposition Services (DLADS) system. Establish procedures to notify BE/IRSO in the event of an incident(s) or the need to perform radiological survey(s) of material that has been identified by DLADS as potentially containing radioactive and/or components.

2.8.5. Ensures RAM is stored in a secure location.

2.9. 22 ARW Command Post:

2.9.1. Ensures BE/IRSO and Flight Medicine are notified immediately if any suspected exposure to radiation, lasers, or EMF is reported.

2.10. Workplace Supervisors:

2.10.1. Identify any use, receipt, or ordering of ionizing or non-ionizing radiation in their workplace to BE/IRSO immediately.

2.10.2. Ensure any planned changes in laser operations are coordinated with their respective URSO. The URSO will then coordinate with BE/IRSO prior to becoming operational.

2.10.3. Aid the URSO and/or permit RSO in ensuring required warning signs, safety devices, and personal protective equipment (PPE), as recommended/required by BE/IRSO, are functional and properly worn or placed before beginning work.

2.11. Individuals:

2.11.1. Learn and implement the rules of radiation safety as described in applicable federal, state, Air Force, and McConnell AFB instructions as well as in organizational operating instructions.

2.11.2. Perform all duties to keep radiation exposures ALARA.

2.11.3. Wear personal monitoring devices if directed by their supervisors and BE/IRSO.

2.11.4. Wear appropriate protective clothing and equipment as prescribed by supervisors and BE/IRSO.

2.11.5. Report incidents, accidents, and hazardous conditions immediately to their supervisors.

2.11.6. Do not override engineering controls, modify PPE, tamper with radiation dosimeters or purposely expose radiation dosimeters to radiation or RAM.

2.11.7. Inform their supervisors of any changes in equipment, procedures, or other factors involving RAM or RPDs that may alter the radiation safety practices or radiation levels in unrestricted areas.

**3. Radioactive Material (RAM).**

3.1. RAM are materials whose nuclei, because of their unstable nature, decay by emission of ionizing radiation. The radiation emitted may be alpha or beta particles, gamma or x-rays, or neutrons. If supervisors suspect or have RAM, contact BE/IRSO immediately to determine requirements.

3.2. Template permits are issued for devices or applications that pose relatively little radiological risk and employ standardized permit conditions. Example of a template permit is the Niton x-ray fluorescence lead paint analyzers containing Cadmium-109. As of the date of this instruction, McConnell does not have any template permits.

3.3. RAM Permit Requests.

3.3.1. All Air Force organizations must obtain a RAM permit from AFMSA/SP3PB prior to receiving, storing, distributing, using, transferring, or disposing permit required RAM. No organization shall apply for a RAM permit without prior coordination with BE/IRSO.

3.3.2. All template permit requests (new, amendments, renewals, or termination) will be accomplished in accordance with guidance given in AFI 40-201, Radioactive Materials (RAM) Management. All requests will be routed through IRSO who will route the request to AFMSA/SP3PB.

3.4. Recordkeeping.

3.4.1. See **Attachment 3, Table A3.1** Ensure recordkeeping in accordance with AFMAN 40-201, Radioactive Materials (RAM) Management.

3.4.2. The following forms/documents are required to be posted in a conspicuous location where the permitted RAM is stored or used: NRC Form 3; permit; and an emergency contact list (**Attachment 2**).

3.4.3. RAM template permit items must be inventoried in accordance with paragraphs 3.6.2 and 3.6.3 of AFI 40-201, Radioactive Materials (RAM) Management.

3.5. General Guidelines.

3.5.1. All conditions on the permit must be known and followed.

3.5.1.1. All RAM requiring permit must be secured from unauthorized access or removal.

3.5.1.2. Permit RSO must notify BE/IRSO within five (5) business days when they change their mailing address or when personnel listed on the permit such as users or RSOs permanently cease their duties or change their names. BE/IRSO will notify AFMSA/SP3PB.

3.5.2. Users of permitted RAM shall receive user training (in accordance with permit conditions).

3.6. Disposal/Recycling of RAM.

3.6.1. Permitted, licensed, and other nonexempt RAM must be disposed of or recycled in accordance with AFI 40-201, Radioactive Materials (RAM) Management and 10 CFR 20, Subpart K, Waste Disposal. All requests for disposal/recycling must be coordinated with BE/IRSO in writing.

3.6.2. Only the permit RSO will work with BE/IRSO to dispose/recycle RAM.

3.7. Generally Licensed Devices (GLD).

3.7.1. The NRC or agreement state (Kansas) issues a general license to acquire, receive, use, store, or transfer certain devices that contain RAM which have been manufactured, tested, and labeled by the manufacturer in accordance with the specifications contained in a specific license issued to the manufacturer by the NRC. These devices are labeled as being generally licensed. GLDs do not require a template permit. Examples of GLDs are the APD-2000 chemical agent detector and Ionscan-400B.

3.7.2. GLDs should be purchased using Defense Federal Acquisition Regulations, assigned a National Stock Number, and registered in the Federal Logistics Information System and Hazardous Material Information Resource System. Local purchase of these devices is strongly discouraged. In either case, devices shall be registered in the Air Force logistics system and identified as radioactive. BE/IRSO will be notified prior of purchase.

3.7.3. GLDs will be leak tested at least every six months. The BEF will coordinate with shop to perform leak tests.

3.7.4. GLDs must not be stored without use for more than 2 years. Unused GLDs should be reported to BE/IRSO.

3.7.5. The URSO and BE/IRSO will ensure that GLDs are disposed of in accordance with AFMAN 40-201, Radioactive Materials (RAM) Management. GLDs will not be taken to DLADS for disposal.

3.8. Radiation Monitoring Equipment.

3.8.1. Radiation survey meters used for determining compliance with Air Force instructions and federal regulations must be calibrated according to American National Standards Institute guidance at intervals not to exceed one year. Calibration records shall be kept in accordance with AFMAN 40-201, Radioactive Materials (RAM) Management.

**4. Non-Destructive Inspection (NDI) Operations.**

4.1. Installation NDI Work Center.

4.1.1. Develop and review annually a local operating instruction for the safe operation of aircraft x-ray equipment that complies with requirements in T.O. 33B-1-1, Chapter 6, Section VIII. Forward the operating instruction to BE/IRSO for approval if changes are required.

4.1.2. Notify BE/IRSO if the process or workload changes or they receive new x-ray equipment; as an x-ray scatter survey is required to be performed on all shielded/unshielded facilities when changes are made in shielding, operation, workload, equipment ratings, or occupancy of adjacent areas when these changes, in the opinion of the BE/IRSO, can adversely affect radiation protection.

4.1.3. Supervisors must inform the BEF when aircraft x-rays will be taken in a shielded/unshielded building, where an x-ray scatter survey has not been performed. The scatter survey must be completed prior to x-ray operations.

4.1.4. Follow recommendations for controls detailed in occupational health survey letters from the BEF.

4.2. Bioenvironmental Engineering Flight (BEF).

4.2.1. Perform an annual Health Risk Assessment (HRA) of the NDI work center; ensure the following are checked annually from T.O. 33B-1-1, Chapter 6, Section VIII; and the results are provided to the unit commander and NDI URSO:

4.2.1.1. Verify the adequacy of operating procedures, safety precautions, administrative or physical controls, the presence and proper use of radiation warning signs and signals, and need for additional surveys. Conduct annual reviews of current procedures and practices; status or outcome of any new facility designs and work orders; current and new restricted areas; radiation training status; exposure control; and monitoring/surveillance activities.

4.2.1.2. Measure exposures accumulated in controlled and uncontrolled areas.

4.2.1.3. Document findings, recommendations, and restrictions.

4.3. General Guidelines.

4.3.1. NDI personnel are required to wear thermoluminescent dosimeters (TLDs) with each aircraft part x-ray session for the entire duration of the session. TLDs will be sent to USAF Radiation Dosimetry Laboratory for annual calibration.

**5. Medical/Dental/Veterinarian X-Ray.**

5.1. Medical/Dental/Veterinarian Services.

5.1.1. Notify BE/IRSO if they receive new x-ray equipment, as an x-ray scatter survey is required to be performed on facilities before the new equipment will be used.

5.1.2. Follow BE/IRSO recommendations for controls detailed in survey letters from the BEF.

**6. Thermoluminescent Dosimeters (TLD).**

6.1. NDI. NDI personnel are required to wear whole body TLDs with each aircraft x-ray session for the entire duration of the session.

6.2. Medical Radiology. Medical radiology personnel are required to wear whole body TLDs for the entire duration of the x-ray session.

6.3. Veterinarian Services. Veterinarian Services personnel must contact the IRSO/BEF if there is a change in any x-ray or radiological procedures for guidance and TLD wear requirements.

6.4. Additional Personnel. As identified by BE/IRSO, additional personnel may be required to wear TLDs. BE/IRSO will take into account historical data, surveillance data, Air Force guidelines, and precedents when deciding who to place on TLDs. Individuals who have the potential to get more than 10% of the annual limit must be on the TLD program.

6.5. General guidelines.

6.5.1. The work center supervisor must ensure TLDs are stored in the area specified by BE/IRSO to ensure no dose is received. The location must be a clean/dry area away from all x-ray operations. The control badge must remain in this location at all times.

6.5.2. Individuals need to ensure TLDs are kept in the work center and not worn outside. Excessive heat and sunlight may potentially damage the TLDs.

6.5.3. TLDs will be exchanged by the BEF quarterly. The work center supervisor must inform BE when a female that is exposed to ionizing radiation becomes pregnant. The BEF will then enroll individual on the TLD monthly monitoring program.

6.5.4. Newly assigned personnel or visitors will provide the required information to the IRSO for entry into the dosimetry program. This includes the worker's social security number, prior work history regarding radiation, and verification of initial training. Failure to provide this information will prevent the worker from working in radiation areas.

6.5.5. As required the IRSO should take into account an individual's off-duty employment (moonlighting) occupational radiation exposure does not exceed allowable occupational exposure limits as specified in DoDI 6055.08. Individuals, whose prior exposure history exceeds allowable occupational exposure limits for the currents calendar year either a result of AF or concurrent off-duty employment moonlighting activities, will be immediately removed from all duties involving occupational radiation exposure.

6.5.6. Annually, BE will provide the worker their yearly cumulative dose record. This form will be signed by BE/IRSO and individual. The form will be maintained with in the BEF and individual's medical record. The BE/IRSO shall retain the USAFSAM Form 1527-1 for a period of five (5) years.

6.6. Temporary Duty Location (TDY)/Deployments.

6.6.1. BE should be notified if a member on the TLD program is going on a TDY or deployment.

6.6.2. Ninety days or less: Individuals will take their dosimeter and a designated transit control dosimeter with them. The accompanying control dosimeter may be issued from spare dosimeters provided to the home base. Note: TDY badges should be hand carried onto the aircraft and not allowed to go through the checked and carry-on baggage scanners; the baggage may be subject to X-ray radiation at a level that could damage the TLDs. The IRSO will be notified if badges should be transit by aircraft.

6.6.3. TDY/deployed locations with an established dosimetry program: While TDY to a location with an established dosimetry program, individuals will obtain necessary dosimetry at the TDY location. If dosimetry support is provided by other than United States Air Force School of Aerospace Medicine (USAFSAM) Department Occupational and Environmental Health Department (OEHD), the individual is responsible for ensuring copies of their dosimetry results are provided to USAFSAM/OEHD for inclusion in the MRER.

6.6.4. TDY/within CONUS: Locations not having an established dosimetry program: individuals on TDY for periods greater than 90 days to locations without an established dosimetry program will receive dosimetry support from their sponsoring organization for the duration of the TDY. Support will necessitate providing dosimetry controls and ensuring exchanges are made in a timely fashion. Gaining organizations anticipating ongoing requirements of this nature are encouraged to establish their own dosimetry programs.

6.6.5. TDY/OCONUS: Locations not having an established dosimetry program. Individuals on TDY for periods greater than 90 days to locations without an established dosimetry program will receive dosimetry support from the nearest location with an established dosimetry program. USAFSAM/OEHD will provide additional dosimetry support to the location providing the support to these individuals. These procedures should be established before member departs TDY for OCONUS locations.

6.7. Personnel Dosimeters. As of the date of this instruction, the BE/IRSO has set the investigative action level at 0.125 Rem per quarter for radiation workers that are not pregnant and 0.020 Rem per month for radiation workers that are pregnant. These limits were based on workers having the potential to get more than 10% of the annual or pregnancy dose limit and the minimum detectable dose (MDD) considered trustworthy by the AF Radiation Dosimetry Laboratory. The purpose of these limits is to maintain ALARA exposures. Exceeding these limits does not mean the individual is overexposed. BE/IRSO will initiate and conduct the investigation and report quarterly, or monthly for pregnant females, if TLD results are at or above these set limits. BE/IRSO must follow procedures outlined in Chapter 9 of DAFMAN 48-125, Personnel Ionizing Radiation Dosimetry. BE/IRSO may change these limits as dictated by professional judgment.

**7. Laser Safety Program.**

7.1. Laser classification. The American National Standards Institute (ANSI) Z136.1 classifies lasers based on the type of hazards present and according to the extent of safety controls required. Classes range from the least hazardous, Class 1, to the most hazardous Class 4 and are categorized as either military specific, research, or FDA Compliant based on use.

7.1.1. The BE/ILSO approves all use of lasers, Class 3B or higher, on the installation, this approval must be gained before purchasing or bringing any new systems on base.

7.1.2. BE/ILSO must be notified of any unit owning, operating, or purchasing a Class 3B or 4 laser, for addition to base laser inventory. The laser classification is typically labeled on the equipment or in the manual. The BEF will routinely assess and document potential laser hazards in industrial workplaces in accordance with their surveillance schedule.

7.2. Laser Safety Training and Controls.

7.2.1. Appointment of a unit laser safety officer (ULSO) is required for units with a class 3B and 4 lasers. Initial and annual refresher training of the ULSO will be performed by the ILSO/BE and documented on the AF Form 55, Employee Safety and Health Record, authorized versions, or an equivalent computer-generated product.

7.2.2. Controls.

7.2.2.1. Enclosure of the laser equipment or beam path is the preferred method of control because the enclosure will isolate or minimize the hazard. Though enclosure is the optimal method of control, this may not be practical for some systems and facilities (i.e., laser ranges and laser pointers).

7.2.2.2. Standard operation procedures (SOPs) will be required for units with Class 3B or 4 lasers. The ULSO will work with the ILSO and workplace supervisor to ensure all the procedures and other controls are both appropriate and reasonable for the work performed.

7.2.2.3. BE/ILSO will recommend the appropriate laser protective eyewear and skin protection, if required, for each laser system. Not all lasers will require protective eyewear. There is no single eyewear adequate for all lasers. Users should not utilize nor purchase protective eyewear not certified for use by BE/ILSO.

7.2.3. Laser Safety Committee. Installations with three or more units using Class 3B and/or Class 4 FDA Compliant or military specific lasers may establish a laser safety committee if deemed necessary by the ILSO based on a hazard assessment. As of the date of this instruction, the laser safety committee has been disbanded due to low threat from the FDA-Compliant lasers and controls enforced for the military specific lasers.

7.3. Medical surveillance.

7.3.1. BE will identify populations with Class 3B or 4 lasers to the Occupational and Environmental Health Working Group (OEHWG) where the type and frequency of medical exams are determined by the Installation Occupational and Environmental Medicine Consultant (usually the SGP) along with an optometrist.

7.3.2. All users of Class 3B and 4 lasers will have initial eye exams prior to operating the system and after a career field change (e.g. cross-training or retirement). The purpose of the medical exams is to serve as a baseline against which accidental eye damage can be measured, and determining if an individual is predisposed to eye conditions or have chronic laser-related injuries. Following any suspected laser injury, the pertinent examinations, as determined by an appropriately qualified provider (e.g., optometrist/ophthalmologist) will be performed.

7.3.2.1. Ocular history: Review past ocular history and family history for any conditions related to the eyes.

7.3.2.2. Visual acuity: Best corrected, distant, and near vision should be measured.

7.3.2.3. Macular function: Test macular function with an Amsler grid using appropriate optical correction to determine if distortion or scotomas exist.

7.3.2.4. Color vision:Use a pseudo-isochromatic plate test (red/green and/or blue/yellow) or similar color vision test to document color vision discrimination.

7.3.2.5. If any non-ocular abnormalities are found, a more extensive examination will be conducted to determine underlying pathology.

7.4. Laser Accidents/Incidents. Any accident/incident involving a suspected laser or other optical radiation overexposure that negatively impacts mission operations; material damage to AF equipment, systems, or sensors; or injury to personnel shall be investigated or documented. In the event of a suspected accident or injury, the following steps will be taken:

7.4.1. The individual(s) involved will immediately notify their supervisor and seek medical care at the closest military treatment facility (MTF); a military MTF is preferred. If the individual is not cared for at an AF MTF, they or their supervisor must contact the installation Flight Medicine on call doctor who will then contact the attending physician immediately to coordinate required medical examinations and treatments.

7.4.2. The workplace supervisor shall notify the unit commander, ULSO, and ILSO within 8 hours of the accident/injury and ensure action is taken to prevent injury to other personnel. This includes taken the system out of service until the accident/incident has been investigated and corrective actions made, as necessary.

7.4.3. The installation SEG will ensure the initial event information is entered into the AF Safety Automated System (AFSAS) IAW timelines mandated in AFI 91-204, Safety Investigations and Reports.

7.4.4. The ILSO will notify the installation SEG, Public Health, Judge Advocate, applicable MAJCOM and Tri-Service Laser Injury Hotline [DSN 798-3764, COMM 937-938-3764 (1-800-473-3549)]. A DoD laser accident/injury reporting form will be completed within 3 duty days following the accident and forwarded to the ESOH service center. This form does not replace the AF Form 190 nor the final investigation report.

7.4.5. Laser investigations will be conducted by the ILSO or installation SEG to determine the event characteristics, root cause, contributing factors, and corrective measures. The following information will be collected for personnel overexposures:

7.4.5.1. Name, rank, unit, position relative to the laser, and Social Security Number of suspected overexposed individual(s).

7.4.5.2. Date, time, location (including facility configuration where diagrams or photographs may be used), and duration of the exposure as well as applicable laser characteristic or parameters (e.g. wavelength, peak and average power, pulse width, frequency, beam diameter, divergence, etc.). Any classified material should be protected and USAFSAM should be contacted before transmitting protected information.

7.4.5.3. A thorough description of the events leading up to the accident/incident with a signed narrative obtained from the individual(s) involved.

7.4.5.4. Personal protective equipment and/or clothing in use during the event. If LEP was worn, the properties shall be annotated to include wavelength and optical density.

7.4.5.5. Reconstruction of the event to calculate the exposure to the individual. If the equipment or expertise do not exist locally, support should be requested through the Laser Injury Hotline.

7.4.5.6. The final report will be completed in AFSAS within 30 workdays and forwarded to the installation Public Health, BE, SEG, Judge Advocate, MAJCOM BE, and the ESOH Service Center with an unclassified copy placed in the medical records section.

7.4.6. For laser incidents involving aircrews or aircraft, the aircrew is requested to immediately report the incident by radio to the appropriate air traffic control (ATC) facility. Reports should include event position (e.g. latitude/longitude), altitude, beam color, originating direction, and any other necessary information believed necessary for the ATC or law enforcement. Upon arrival to their destination, all aircrew personnel that have been affected are requested to seek medical care at the local MTF (where the attending physician will notify the ILSO) and complete the Laser Beam Exposure Questionnaire or equivalent (**https://www.faa.gov/aircraft/safety/report/laserinfo/**).

7.5. Laser Procurement and Disposal

7.5.1. Laser Procurement. The requesting unit or contracting office will coordinate with the ILSO prior to introducing/purchasing Class 3B or 4 lasers on the installation. A written request with the following criteria will be provided for the ILSO to complete a hazard assessment and approve/disapprove the laser system:

7.5.1.1. Manufacturer, model number, serial number, quantity, laser class, and mode of operation (if the laser operates in continuous wave, single phase, or multiple pulse).

7.5.1.2. Scope of work to include intent and frequency of operations and controls to minimize hazards to operators.

7.5.1.3. Laser system safety review board (LSSRB) approval letter for military specific lasers or compliance paperwork filed with the FDA for FDA Compliant lasers.

7.5.2. Laser Disposal

7.5.2.1. Military specific lasers must not be released outside of the AF unless it is transferred to another DoD Service that has approved the use of the system;, has been brought into full compliance with 21 CFR 1040.10 and 1040.11; has compliance paperwork filed with the FDA; or has been destroyed IAW DODM 4160.21, Volume 1, Defense Materiel Disposition: Disposal Guidance and Procedures.

7.5.2.2. Lasers that are unclassified, off-the-shelf models (such as laser etchers and engravers), may be traded in or returned to the manufacturer.

7.5.2.3. The laser may also be turned into the local AF Defense Reutilization and Marketing Office as excess equipment. Completing the required documentation will transfer ownership of the laser system to this group.

## 8. Electromagnetic Field (EMF) Safety Program.

8.1. EMF Health Risk Assessments

8.1.1. All EMF transmitters owned and operated by avionics workplaces, communications facilities, industrial processes, and medical facilities shall be identified during BE's routine workplace surveillance and determine whether the EMF emitter is hazardous given system parameters from the workplace supervisor.

8.1.1.1. Commercially procured telecommunications systems designed for public use (e.g. Wi-Fi routers, cellphones, microwaves, computers, etc.) that are used in their manufactured conditions do not require evaluations. Medical treatment devices do not require a special evaluation beyond manufacturer recommendations.

8.1.2. EMF transmitter inventories will be maintained and conducted at a minimum, biennially. BE will coordinate with the Weapons Safety Manager and Installation Spectrum Manager or equivalent to ensure a comprehensive base inventory. The inventories will include at a minimum the following categories: work center, point of contact and phone number, emitter nomenclature, emitter description, quantity, frequency range, upper and lower tiers maximum permissible exposures (MPEs), and hazard distances.

8.1.3. The BEF will provide control recommendations for hazardous EMF systems.

8.2. EMF Protection Standards

8.2.1. MPEs are established for lower and upper tier environments. Lower Tier environments represent locations where EMF exposures do not exceed the MPEs in Table A2.2. of AFI 48-109. Such locations generally represent living quarters, workplaces, or public access areas where personnel would not expect to encounter higher levels of EMF energy. Upper Tier environments represent areas that are occupied by individuals aware of their potential for EMF exposures. Workplace supervisors will provide education and training for workers in these environments.

8.2.2. Baseline, periodic, and termination occupational medical examinations are not required.

8.2.3. There are no special EMF exposure limits for pregnant females. Any level EMF environment that is safe for the mother is also safe for the developing embryo or fetus. Pregnant workers will follow the requirements in their profile.

8.3. Administrative Controls

8.3.1. In areas where engineering controls or other methods are not adequate, appropriate warning signs will be placed to restrict access to areas where the potential exists for EMF exposures to exceed exposure limits.

8.4. Electro-Magnetic Frequency (EMF) Safety Training.

8.4.1. Workplace personnel with the potential to exceed the Lower Tier MPEs (Table A2.2 of AFI 48-109 will be provided initial and refresher training. The installation BE flight will assist with the development of training for other personnel as required incorporating the following topics: location of emitters, areas can exceed MPE, control procedures, response to suspected overexposure, bio-effects, risk/hazard assessment, standards, measurements, operation of RF emitter (equipment), PPE, lock-out /tag-out, reports, investigations, risk communication, properties of RF, RF physics and antenna characteristics.

8.4.2. Initial and annual training must be documented to show that employees are adequately trained. This training shall be documented on the AF Form 55 or equivalent computer-generated product.

8.5. EMF Accidents/Incidents: BE shall investigate and document all alleged incidents involving personnel exposure that may exceed the upper tier MPEs in Table A2.1 of AFI 48-109. The following immediate actions must be taken whenever a suspected or alleged overexposure has occurred:

8.5.1. The individual will immediately report the incident to their supervisor and seek medical examination and recommendations for medical follow-up within 72 hours of exposure if the afflicted is at, or above five times the upper tier MPE as determined by BE.

8.5.2. The workplace supervisor will notify BE, Public Health, and the installation SEG of the incident and provide documentation with a description of the circumstances surrounding the incident and statements from personnel involved. Unless operations are deemed mission critical, the supervisor will cease operations and leave the transmitter settings in place for BE to investigate. Otherwise, the settings at the time of the incident will be documented.

8.5.3. BE will contact the DoD EMF Injury Hotline (ESOH Service Center) at 1-888-232-3764 or DSN 798-3764 and provide initial notification of the alleged incident to the MAJCOM BE and AFMSA/SG3PB. BE will conduct a preliminary investigation of the alleged incident and perform a reconstruction of the incident, to include field measurements if warranted.

8.5.4. Upon completion of the investigation and within 30 workdays, a detailed report shall be forwarded to PH, SEG, MAJCOM BE, AFMSA/SG3PB, with a courtesy copy to the ESOH Service Center. BE shall complete the report in AFSAS.

## 9. ALARA Training.

9.1. General Guidelines.

9.1.1. Organizations requiring annual ALARA training will be identified by the BEF through routine occupational and environmental health surveillance. Contact the BEF regarding requests for ALARA training.

9.1.2. The BEF will provide each organization training material specific to the unit’s occupational radiation hazard.

9.1.3. Shop supervisors will be responsible for ensuring this training is documented on the AF Form 55 or equivalent computer-generated product.

9.1.4. Shop supervisors will ensure new workers are briefed on presence of radiation and review ALARA training information.

**10. Historical Office/Static Display Manager.**

10.1. Radiation in museum-accessioned historical property. As of the date of this instruction, there is no detectable radiation on any of the historical property located on base. If radiation is ever discovered in museum-accessioned historical property, whether aerospace vehicle or any other artifact; BE/IRSO will be notified. The BEF will conduct a survey of any new items.

10.2. Handling of Artifacts. Handling of artifacts that contain RAM is not authorized. All entries made into static display aircraft must be coordinated with BE/IRSO.

GEORGE N. VOGEL, Colonel, USAF
Commander

**Attachment 1**

**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION**

***References***

AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program,* 21 April 2020

AFI 48-139, *Laser and Optical Radiation Protection Program*, 21 April 2020

AFMAN 40-201, *Radioactive Materials (RAM) Management*, 28 March 2019

AFMAN 48-148, *Ionizing Radiation Protection,* 19 July 2020

AFI 33-322, *Records Management and Information Governance Program,* 23 March 2020

DAFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*, 27 October 2020

AFPD 48-1, *Aerospace & Operational Medicine Enterprise,* 4 June 2019

ANSI Standard Z136.1, *American National Standard for Safe, Use of Lasers,* 16 March 2007
DODI 6055.11, *Fields Protecting Personnel from Electromagnetic,* 12 May 2021

IEEE Standard C95 7-2005, *IEEE Recommended Practice for Radio Frequency Safety Programs,* 22 March 2006

Bioenvironmental *Engineer's Guide to Ionizing Radiation,* 1 October 2005

Bioenvironmental *Engineer's Guide for Lasers and Optical Radiation,* August 2014

Bioenvironmental *Engineering Program Management Guide: Laser Safety*, September 2019

T.O. 33B-1-1, *Nondestructive Inspection Methods, Basic Theory*, 15 May 2014

***Prescribed Forms***

None

***Adopted Forms***

AF Form 847, *Recommendation for Change of Publication*

***Abbreviations and Acronyms***

**AFMSA**—Air Force Medical Support Agency

**ALARA**—As Low As Reasonably Achievable

**AMC**—Aerospace Medicine Council A

**MDS**—Aerospace Medicine Squadron

**ANSI**—American National Standards Institute

**BE**—Bioenvironmental Engineer

**BEF**—Bioenvironmental Engineer Flight

**DoD**—Department of Defense

**DoE**—Department of Energy

**DLADS**—Defense Logistics Agency Disposition Services

**DTR**—Defense Transportation Regulation

**EMF**—Electro-Magnetic Frequency

**EMFR**—Electro-Magnetic Frequency Radiation

**EPD**—Electronic Personal Dosimeter

**ESOHC**—Environment, Safety, and Occupation Health Council

**GLD**—Generally Licensed Device

**HRA**—Health Risk Assessment

**IEEE**—Institute of Electrical and Electronics Engineers

**ILSO**—Installation Laser Safety Officer

**IRSO**—Installation Radiation Safety Officer

**NDI**—Non-Destructive Inspection

**NRC**—Nuclear Regulatory Commission

**OEHWG**—Occupational and Environmental Health Working Group

**OPR**—Office of Primary Responsibility

**OEHD**—Occupational and Environmental Health Department

**PH**—Public Health

**PPE**—Personal Protective Equipment

**RAM**—Radioactive Material

**RIC**—Radioisotope Committee

**RPD**—Radiation Producing Device

**RSO**—Radiation Safety Officer

**TDY**—Temporary Duty Location

**TLD**—Thermoluminescent Dosimetry

**ULSO**—Unit Laser Safety Officer

**USAFSAM**—United States Air Force School of Aerospace Medicine

**URSO**—Unit Radiation Safety Officer

## Attachment 2

## PERMIT RADIATION SAFETY OFFICER CONTACT INFORMATION

**Table A2.1. Permit Radiation Safety Officer Contact Information.**

| Name | Phone Number |
|---|---|
| IRSO | 316-759-5104 |
| AF Medical Service Agency Radiation Program | Commercial: 703-681-6946<br>DSN: 761-6946, 7855 |
| U.S. Nuclear Regulatory Commission (NRC), Region IV | (800) 952-9677 |
| NRC Safety Hotline | (800) 695-7403 |
| Radioisotope Committee (RIC) Secretariat Representative,<br>24 Hours on Call | Commercial: 301-981-5058,<br>DSN: 858-5058 |
| United States Air Force School of Aerospace Medicine,<br>ESOH Service Center (All Hours, at Wright Patterson) | Commercial: 937-938-3764<br>DSN: 798-3764 |
| United States Air Force School of Aerospace Medicine<br>(USAFSAM) Consulting Branch (at Wright Patterson) | Commercial: 937-938-3328/3329<br>DSN: 798-3328/3329 |
| USAFSAM Radioanalytical Branch | Commercial: 937-938-3666/3360<br>DSN: 798-3666/3360 |
| USAFSAM Radiation Dosimetry Branch | Commercial: 937-938-3588<br>DSN: 798-3588 |
| AFMOA/SGOR (RIC) | Commercial: 202-536-4307<br>DSN: 297-4307, 4309 |
| AFMOA/SGOR (RIC), After Hours | Cell: 703-340-0819 |
| AF Radioactive Recycling and Disposal | Commercial: 937-257-2010<br>DSN: 787-2010 |
| Base Command Post | 316-759-3251 |

## Attachment 3

## PERMIT RAM RECORDKEEPING

**Table A3.1. Record Retention Requirements.**

| Required record | Record Maintenance | Notes | CFR |
|---|---|---|---|
| Provisions of Radiation Protection Program | Until permit termination | | 10 CFR Part 20.2102(b) |
| Annual Audit, Reviews of Radiation Protection Program | 3 years after record is made | | 10 CFR Part 20.2102(b) |
| Surveys, Inventories, and Calibrations | 3 years after record is Made | | 10 CFR Part 20.2103(a) |
| Leak Tests | 3 years after test was conducted. | | |
| Nuclear Regulatory Commission Form 4 | Until permit termination | Dose estimate of prior occupational exposure | 10 CFR Part 20.2104 (f) |
| Accident and Incident Reports and Records | Permanent archival storage. | | |
| Decommissioning Records | Until site released for unrestricted use. Permanent archival storage is required for large decommissioning efforts that are compliant with NUREG 1757, Vol 3. | Can transfer to new permit. Include records of spills, as built drawings, restricted areas, cost estimates, etc. | 10 CFR 30.35 (g)<br>10 CFR 30.36<br>10 CFR 30.51 |
| Receipt or Transfer of Permitted Material | As long as possessed, and three years after disposal or transfer | Unless otherwise specified. | 10 CFR 30.51 (a) (1)(2) |
| Disposal of Permitted Material | Until permit termination or three years, whichever is longer. | Disposal records of significant magnitude or cost (e.g. site decommissioning wastes): Permanent Archival Record. | 10 CFR Part 20.2108<br>10 CFR 30.51 (a)(3) |
| Records relating to the treatment and/or disposition of low level Radioactive Materials (RAM) and mixed waste | 50 years | Prescribed retention period for specified environmental planning documents. | Rule 17 of the Air Force Records Disposition Schedule |

| **Required record** | **Record Maintenance** | **Notes** | **CFR** |
|---|---|---|---|
| Sealed Source Leak Tests and On/Off Mechanism and Indicator | 3 years after last leak check / mechanism check or till transfer or disposal | Removal, installation, shielding or containment | 10 CFR Part 31.5 (c) (4) i. and ii. |
| Records of Shipment of RAM Shipped Under 10 CFR Part 71 Rules | 3 years after shipment | Does not include RAM exemption under 10 CFR Part 71.10 (low level, such as less than type A) | 10 CFR Part 71.91 (a) |
| Duties and Responsibilities of Radiation Safety Officer | Duration of permit | | 10 CFR 35.2025(b) |
| Radiation Survey Instrument Calibrations | 3 years | | 10 CFR 35.2061 |