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TINKER AIR FORCE BASE**



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IONIZING RADIATION PROTECTION

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This instruction implements AFI 48-148, *Ionizing Radiation Protection*, a companion document to AFI 40-201, *Managing Radioactive Materials in the USAF*, AFI 91-108, *Air Force Nuclear Weapons Intrinsic Radiation Safety Program* and AFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*. This instruction supports and supplements Federal, State and military requirements at Tinker Air Force Base for protection of civilian and military personnel and their dependents from ionizing radiation. It also specifies requirements to protect the general public from exposure to ionizing radiation resulting from TAFB activities. The instruction supplements requirements of AFI 48-148 and AFI 40-201 that clarifies responsibilities of associated personnel, organizations, and tenants, as applicable, on TAFB. It applies to Air Force Reserve and Air National Guard units, except where noted otherwise. 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 Form 847s through publications/forms managers. All records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS).

SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include clarification and explanation of the Oklahoma City-Air Logistic Complex (OC-ALC) and Defense Logistics Agency (DLA) RAM disposal processes in Chapter 6.

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Chapter 1

RESPONSIBILITIES

1.1. Tinker Air Force Base (TAFB) Unit Commanders, Directors or Equivalent in coordinated effort to keep radiation exposures As Low As Reasonably Achievable (ALARA), will ensure:

1.1.1. A qualified individual is appointed, in writing, as the Unit Radiation Safety Officer (RSO) to act as the single focal point for the unit on radiation protection matters. **NOTE:** IAW AFI 48-148 the Installation Commander designates, in writing, an installation radiation safety officer (IRSO). The IRSO at Tinker AFB is a Base Bioenvironmental Engineer, with additional training as an RSO.

1.1.2. Ensure that the IRSO is notified of all planned uses of radioactive material (RAM) and Radiation Producing Devices (RPDs) on the installation.

1.1.3. Contact the IRSO as early as possible in the acquisition process, whenever RAM or RPDs are required, to obtain written approval.

1.1.4. If necessary, submit an application for licensed RAM to the USAF Radioisotope Committee Secretariat (RICS) coordinated through the IRSO.

1.1.5. A Permit RSO is appointed and approved by the NRC, State of Oklahoma (State) or USAF Radioisotope Committee (RIC) to manage the radiation protection aspects associated with the use of RAM or RPDs for which a NRC, State or RIC permit or license must be or has been issued. A copy of the appointment letter along with other official permit or license correspondence will be provided to the IRSO.

1.1.6. Personnel comply with accepted health precautions recommended by the 72d Medical Group.

1.1.7. All operating activities comply with Air Force directives covering permitting, procuring, requisitioning, storing, handling, accountability, recycling and disposal for all RAM and RPDs.

1.1.8. Personnel and activities using RAM and RPDs are monitored routinely. (Refer to responsibilities of Unit and Permit RSOs as applicable).

1.1.9. Ensure that the IRSO is notified of any abnormal exposures or suspected overexposures to ionizing radiation.

1.2. Base Civil Engineer Directorate (72 ABW/CE) Director shall:

1.2.1. Ensure all plans for modification of existing facilities or design of new facilities which involve the use of RAM or RPDs are reviewed to ensure radiation issues are addressed and ALARA is considered. This will be done with the assistance and coordination of the IRSO/Bioenvironmental Engineering Flight (BEF). **NOTE:** In general BEF must be included in coordination with on ALL facility modification and new facility designs. This instruction explicitly calls for coordination with the IRSO and/or BEF for facilities involving the use of RAM and/or RPD(s).

1.2.2. Contact the IRSO upon the discovery or knowledge of a location that may contain radioactive waste.

1.2.3. Provide all design reviews and work order requests involving potential use, movement or disposal of RAM to the IRSO for review and approval prior to allowing work to commence on contract.

1.3. IRSO shall:

1.3.1. Provide consultative support to the installation commander, unit commanders, unit RSOs and workplace supervisors on radiation protection issues.

1.3.2. Define health hazards and hazardous areas and recommend appropriate control measures to supervisors and users.

1.3.3. Enforce all federal, Air Force, state and installation rules and instructions relating to radiation safety.

1.3.4. Ensure that personnel and area monitoring are accomplished as required by applicable rules and instructions.

1.3.5. Review all plans for modification of facilities or design of new facilities which involve the use of RAM or RPDs to ensure that ALARA is considered.

1.3.6. Review, approve and oversee use of RAM and RPDs by non-Air Force organizations on Tinker AFB.

1.3.7. Coordinate with and assist the Unit and Permit RSOs in preparing applications for RAM or RPD permits/licenses and/or amendments thereto and as necessary to ensure a comprehensive, coordinated radiation protection program to keep ionizing radiation exposure ALARA. This includes evaluating TAFB Thermoluminescent Dosimeter (TLD) results from the USAF School of Aerospace Medicine, Occupational and Environmental Health (USAFSAM/OEHHD) Radiation Dosimetry Laboratory (AF RDL) and determining necessary investigation actions.

1.3.8. Oversee the TLD Program and review worker TLD results, AF Form 1499, Occupational Radiation Exposure Report, and AF Form 1527, Annual Occupational Exposure History to Ionizing Radiation, and provide results to respective Unit RSOs and document delivery and receipt as required by AFMAN 48-125.

1.3.9. Review all new requests for use of RAM or RPDs consistent with the ALARA concept and ensure that personnel involved with the use of these materials and devices are qualified (by virtue of training, education and experience) to use them.

1.3.9.1. Provide guidance to contracting officers, contract originators and contract monitors on contract material submittal requirements and procedures for operating safely on TAFB.

1.3.9.2. Ensure federal and state regulatory requirements are met for contractors and provides written approval as required.

1.3.10. Review all work orders prepared for installation-level actions involving potential use, movement, transfer or disposal of RAM.

1.3.11. Conduct surveys and assessments of locations where RAMs are received, used or stored, or where radioactive wastes are stored, buried, or not otherwise covered by a permit, in accordance with AFI 48-145, Occupational and Environmental Health Program.

1.3.12. Accomplish necessary leak testing of generally licensed devices (GLDs) semiannually unless otherwise specified by the device labels.

1.3.13. Advise in emergency radiation safety operations in the event of accidents, incidents or overexposures involving RAM or RPDs according to AFI 40-201.

1.3.14. Ensure investigations are conducted for overexposure and suspected overexposure of employees including pregnant female employees who work in areas which use, store and/or transport RAM and RPDs.

1.3.15. Assist local, host or tenant organizations requesting permission to use RAM that requires a permit under the Air Force Master Materials License (MML). Supports installation organizations in the application process and serves as a liaison with the RICS.

1.3.16. Manage and control the radioactive waste disposal program which ensures proper packaging, storage, transport and disposal of RAM by TAFB organizations IAW AFI 40-201

1.3.16.1. Coordinate RAM disposal and transport procedures through the Air Force Radioactive Recycling and Disposal Office (AFRRAD).

1.3.17. Provide annual brief and periodic updates concerning use and storage of RAMs to the Installation Commander, Fire Chief, and Civil Engineer. Briefings may be included with ESOHC/equivalent briefing.

1.3.17.1. As required by T.O. 33B-1-1, Nondestructive Inspection (NDI) Methods, Basic Theory, for NDI shops' annual assessments, "generate a formal report of assessment findings and deliver it to the Unit Commander, Laboratory Supervisor and the Air Force NDI Program Office at TAFB."

1.3.18. The IRSO will determine whether or not an individual or a unit would be enrolled in the monitoring program based on radiation survey assessments. **NOTE:** Qualified BEF personnel (by virtue of education, training and experience) may be appointed by the BEF Commander to assist the IRSO in their responsibilities.

1.4. Permit RSO for permit, license or TAFB authorizations shall:

1.4.1. Coordinate with the permittee on requests for a new permit, amendments to an existing permit or termination of a permit.

1.4.2. Perform those radiation protection duties at the unit level commensurate with their training and experience.

1.4.3. Submit to the IRSO for review any new or revised Instructions (I), Standard Operating Procedures (SOPs) or unit instructions impacting the radiation safety program prior to implementation.

1.4.4. Establish controls to prevent unauthorized use or transfer of RAM within the unit (to include RAM used in classified operations).

1.4.5. Annually brief the permittee and IRSO on the permit radiation safety program including the program's regulatory compliance and those exposures are ALARA.

Documents the annual brief with a memo or Staff Summary Sheet signed by the permittee and maintained with permit records.

1.4.6. Ensure annual training is conducted in accordance with 10 CFR 19.12, and commensurate with the permit level of radiation risk. Implementation should follow guidance in NRC NUREG 1556-series for the applicable permit type (see AFI 40-201, Attachment 1 and AFI 48-145, Occupational and Environmental Health Program, section 3.3 for additional information). Coordinate radiation surveys of hazard evaluation activities with the IRSO.

1.4.7. Assist the permittee and IRSO to determine, report, promptly investigate and correct:

1.4.7.1. The causes, severity and results of mishaps or incidents involving ionizing radiation.

1.4.7.2. Non-compliance or other variation(s) from approved radiation safety requirements.

1.5. Unit RSO shall:

1.5.1. Brief unit commander annually on radiation safety program to include procedures to maintain exposures ALARA.

1.5.2. Coordinate with the Installation and Permit RSOs as necessary to ensure a comprehensive, coordinated radiation protection program is established and maintained. This includes evaluation of radiation dosimetry results and training.

1.5.2.1. Review and verify AF Form 1499, Occupational Radiation Exposure Report, and AF Form 1527, Annual Occupational Exposure History to Ionizing Radiation, from the IRSO. Refer to 3.1.5 for information on maintaining these forms.

1.5.2.2. Provide initial and annual radiation safety training to personnel. Ensure training is properly documented. This training must be documented in AF Form 55, Employee Safety and Health Record, or equivalent electronic record. Request assistance from the IRSO as needed.

1.5.3. Receive and ship RAMs in coordination with the IRSO, Defense Logistics Agency (DLA) RSO and/or DLA Hazardous Materials Shipping/Receiving Manager and in compliance with DOT requirements in 49 CFR 173.

1.5.4. Maintain an inventory of all RAM sources and RPDs for your unit.

1.5.5. Inform the BEF of any changes in equipment, operating parameters or procedures involving RAM or RPDs.

1.5.6. Report incidents, accidents and hazardous conditions promptly to BEF at 734-7844 (duty hours) or through the command post at 734-7313 (after duty or weekend hours). This includes loss or theft, abnormal exposures and suspected overexposures.

1.5.7. Conduct appropriate actions as directed by the IRSO in keeping ionizing radiation exposure ALARA and conducting overexposure and abnormal exposure investigations.

1.5.8. Forwards unit personnel's off-duty or moonlighting radiation dose records to IRSO for inclusion into the Member Radiation Exposure Record. For units without a URSO, see paragraph 1.9.5.

1.6. AFSC/PZIO shall:

1.6.1. Ensure contract originators and contract monitors are aware of their duties to the AF policy, the Federal Acquisition Regulation (FAR) and this instruction.

1.6.2. Require contractors to provide their own support for federal and state regulatory compliance when using RAM or RPDs.

1.6.3. Per AFI 40-201, section 3.4.5.1, ensure contractors coordinate IRSO's written approval for use of ionizing radiation sources on AF installations at least 30 calendar days before bringing the materials onto the installation.

1.6.4. Monitor and review contracts on projects in which contractor(s) requires the use of devices that contain radioactive materials (RAM), e.g., soil density gauges, radiography cameras, or use of radiation producing devices (RPD), e.g., portable x-ray machines.

1.7. Contractors shall:

1.7.1. Notify contracting officer, contract monitor or IRSO whenever the use of RAM or RPDs is anticipated.

1.7.2. Obtain written approval from the IRSO prior to bringing RAM or RPDs onto TAFB (this includes shipping, transfer, receipt, use or storage).

1.7.3. Provide information on location, description of use and duration. Specific information describing the type/isotope, quantity/activity and intensity of radiation should be included. This enables the installation to assess impacts to operations, personnel and facilities and, in the event of an accident, enables emergency responders to safely conduct operations.

1.7.4. Ensure a contractor health and safety plan is established. These procedures must be followed IAW the federal or state license/permit. Contractors should be reminded that they are solely responsible for the safety and health of their employees.

1.7.5. Have a responsibility to immediately contact the contracting officer and IRSO whenever their radioactive items/devices may impact AF operations, personnel, facilities or real estate. Once aware of the impacts, the IRSO is responsible for assessing these risks, ensuring compliance and making appropriate notifications.

1.7.6. Anticipate spot checks and/or audits, as required. Spot checks of contractor operations are necessary to enforce AF policy on management and control of RAM or RPDs on AF installations.

1.7.7. Contractors performing services involving the use of RAM under the auspices of their own NRC or Agreement State License shall provide a copy of the license to the IRSO. For contractors licensed by an Agreement State, a completed copy of NRC Form 241, Report of Proposed Activities in Non-Agreement States, shall be submitted to the Unit RSO. The IRSO shall be notified when the operation is terminated.

1.8. DLA Disposition Services shall:

1.8.1. Immediately notify the IRSO of any suspected RAM-contaminated items.

1.8.2. Ensure the radiation detection system in-place is confidence checked regularly as described by manufacturer. Inform leadership and request resources to fix any identified

defects. Inform the IRSO when equipment is not functioning correctly and provide an estimated completion date for repair/replacement.

1.9. Shop Supervisors shall:

1.9.1. Notify the IRSO and unit RSO of changes in practices or procedures involving radiation sources, potential violations of this instruction, unsafe work practices involving radiation sources, or accidents or incidents involving radiation.

1.9.2. Ensure shop complies with radiation requirements as identified in BEF routine industrial hygiene survey.

1.9.2.1. Ensure Ionizing Radiation Safety (ALARA) Training (approved by BEF) is taught to new employees within 30 days of assignment to the shop and employees receive the training every 12 months. This training must be documented in AF Form 55, Employee Safety and Health Record, or equivalent electronic record.

1.9.3. For personnel required to be in the TAFB TLD Program:

1.9.3.1. Ensure new employees report to BEF (72 AMDS/SGPB) at Building 3334 prior to start of work that requires enrollment in the TLD Program. Contact BEF at 734-7844 to schedule an appointment.

1.9.3.2. Ensure pregnant females report to Public Health (72 AMDS/SGPM) when pregnancy is declared.

1.9.3.3. Notify BEF 30 days prior to projected termination of worker employment for removal of the employee from the TLD program.

1.9.4. Provide results of dosimetry measurements to workers promptly upon receipt and provide signed confirmation of receipt back to the IRSO.

1.9.5. For units without a URSO, provide off duty or moonlighting dosimetry data from the worker to the IRSO.

1.9.6. Ensure no RAM is shipped or accepted without proper authorization. In addition, immediately notify the IRSO upon arrival or prior to shipment to conduct leak testing (if required).

1.9.7. Submit requests for radioactive waste disposal to the IRSO.

1.9.8. Report incidents, accidents and hazardous conditions involving ionizing radiation promptly to BEF during duty hours and command post after hours. This includes loss or theft, abnormal exposures and suspected overexposures.

1.10. Employees Who Work with RAM and/or RPDs shall:

1.10.1. Become familiar with and practice the rules of safety and good housekeeping for their particular position.

1.10.2. Wear personal dosimetric devices as assigned by their supervisor and the BEF.

1.10.3. Wear adequate protective clothing and equipment as recommended by the BEF and provided by the shop supervisor.

1.10.4. Strive to keep their exposure to ionizing radiation ALARA.

1.10.5. Comply with shop, unit and base requirements as pertaining to ionizing radiation.

1.10.6. Provides the URSO and/or IRSO information on past and current work relevant to ensure comprehensive effective protection and safety for themselves and others. Provides off duty or moonlighting dosimetry data to the URSO and IRSO.

1.10.7. Report incidents, accidents and hazardous conditions promptly to shop supervisor, Unit and Permit RSOs. This includes loss or theft, abnormal exposures and suspected overexposures.

Chapter 2

RAM, RPDS AND RADIATION EXPOSURE LIMITS

2.1. Radioactive material (RAM). RAM includes any item that emits radiation without external power. Examples are byproduct, source and special nuclear material as defined in the Code of Federal Regulations (CFR), Title 10, Parts 30, 40 and 70. Products distributed as exempt by a manufacturer licensed to distribute to exempt persons do not require a permit, if used for their intended purpose. Any unusual activities involving these sources, such as attempting to remove the RAM from the item or accumulating large quantities of these items for storage may require a permit. Although there are no administrative controls over these items, they may require controlled disposal. If there is any doubt as to the requirement for a permit or the proper method of disposal, contact the IRSO for guidance.

2.2. A radiation-producing device (RPD). RPD is any piece of equipment that emits ionizing radiation, regardless of intent, when energized by an external power source. Examples include medical and industrial x-ray machines, x-ray diffraction and fluorescence units, scanning and transmission electron microscopes and particle accelerators. In general, any device that accelerates electrons or other atomic particles with a potential difference of 10,000 volts or greater and produces x-radiation, either intentionally or unintentionally, may require an RPD permit. Some exceptions are television monitors, cathode ray tubes and video display terminals which are manufactured under the strict requirements of 21 CFR 1020.10. If there is any doubt as to the requirement for a permit, contact the IRSO for guidance. **NOTE:** RAM or RAM sources that are excluded for permit, license or IRSO authorization for use must be used for their intended purposes. Any unusual activities involving these sources, such as attempting to remove the radioisotope(s) from the item or accumulating large quantities of these items for storage may require a permit, license or IRSO authorization. Although there are no administrative controls over these items, they may require controlled disposal. If there is any doubt as to the requirement for a permit, license or IRSO authorization or the proper method of disposal, contact the IRSO for guidance. The possession and use of Generally Licensed Devices (items that contain RAM) distributed under 10 CFR 31 must comply with certain NRC and USAF requirements. Purchase, acquisition, receipt, storage, use, shipping, recycling and disposal of such devices shall be coordinated with the IRSO.

2.3. Radiation Exposure Limits

2.3.1. Personnel Exposure. Personnel who work with RAM or RPDs may be exposed to radiation during the course of their employment. The goal of the radiation protection program at TAFB is to maintain all radiation exposures ALARA. However, it may be impossible to completely eliminate all radiation exposure. As a result, it is important to understand the procedures used to monitor for radiation exposure and also the significance of a radiation dose obtained during routine work activities.

2.3.2. Dose limits. 10 CFR Part 20 specify the maximum permissible dose limits:

Table 2.1. Radiation Workers

In any calendar year	Occupational	Minors (16-18 years)
Whole body (TEDE) †	5 rem	0.5 rem
Lens of eye	15 rem	1.5 rem
Skin or extremities	50 rem	5 rem
† Whole body equates to external exposure of the head, trunk, arms above the elbow or legs above the knee. Total Effective Dose Equivalent (TEDE) is total effective dose equivalent.		

Table 2.2. Members of the Public

One year	100 mrem
In any one hour	2 mrem
‡ The dose in any unrestricted area resulting from AF controlled radiation sources shall not exceed the limits specified above.	

Table 2.3. Embryo/Fetus

Entire pregnancy	500 mrem
Monthly	50 mrem

Chapter 3

MONITORING

3.1. The BEF Will: Ascertain that ionizing radiation exposure monitoring is conducted to document the radiation dose received by employees working in environments where RAM and RPDs are used, handled, stored or disposed of to ensure and maintain personnel exposures ALARA according to the requirements of AFMAN 48-125.

3.1.1. The supervisor, or designated radiation dosimeter monitor, of a newly assigned worker has the responsibility to request radiation monitoring for that individual. Monitoring shall be required if the worker shall be located in an area designated by the IRSO as a potential radiation hazard area or if, because of the assigned duties, the individual is classified as a radiation worker requiring dosimetry.

3.1.2. Thermoluminescent dosimeters (TLDs) shall be furnished by the USAF Radiation Dosimetry Laboratory and distributed by the BEF. There are three types of badges and depending on the type of radiation work performed, one, two or possibly all three will be issued to a single individual—whole body badge, collar badge and extremity badge or finger badge

3.1.3. All radiation badges should be worn while working in a designated radiation use area. The badges should be donned before beginning work and removed after leaving the radiation use area. When not being worn, the badges must be stored on a rack or board of some kind in a radiation-free environment along with a control badge. This location is normally called a "control board." The control badge always remains on the control board. Its purpose is to measure the background radiation level in the storage area and while the badges are transported to the lab so that this radiation exposure can be subtracted from the measured values on the personnel badges since this exposure represents radiation not received by the badge while worn in the work environment. Badges must never be taken home or stored in any other location such as desk drawers or attached to lab coats. Badges should also never be worn when undergoing medical radiation procedures such as diagnostic x-ray or dental examinations, nuclear medicine evaluations or radiation therapy treatments. Badges will provide an accurate measure of the radiation to which an individual is exposed only if they are worn and stored properly. If a badge is lost or damaged an investigation will be performed by the IRSO to estimate the exposure actually received during that monitoring period. The individual to whom the badge was issued shall be required to sign a statement explaining the circumstances of the loss or damage.

3.1.4. Each individual to be monitored shall be provided with a radiation safety briefing to include an explanation concerning proper wearing and storage of the dosimeter and the right to review the dosimetry results each month or quarter.

3.1.5. The TLDs will be collected by the BEF quarterly (or monthly for special monitoring, i.e. pregnant workers) and processed by the AF RDL. Monitoring results will be provided and handled as described here:

3.1.5.1. AF Form 1499 will be submitted by the AF RDL to the BEF documenting the quarterly (monthly) dose exposures to individuals. The IRSO/BEF will forward copies to

Unit RSOs/Supervisors, using signed receipt, for availability to employees monitored. It is the shop supervisor's responsibility to keep their employees' 1499s up to one year until the employees receive their AF Form 1527 (annual dose exposure report).

3.1.5.2. Each Unit and the BEF shall maintain the AF Form 1499 until AF Form 1527, Annual Occupational Exposure History to Ionizing Radiation, is received from the AF RDL and copies are forwarded by the BEF to Unit RSOs/Supervisors, using signed receipt, who in turn shall provide the forms to employees monitored in the TLD Program. The Unit RSO/Supervisor shall obtain the signed receipt from each individual for which there is an AF Form 1527 in their Unit and forward signed receipt(s) to the IRSO/BEF within 10 business days after the Unit receives the forms. For Guard or Reserve Units, this may be extended to a drill weekend. The IRSO shall retain the AF Form 1527 IAW AFI 48-148.

3.1.5.3. The Unit RSO/Supervisor shall inform the IRSO/BEF of any mistakes on the forms promptly so they can be corrected.

3.1.6. The supervisor shall not permit anyone to enter a radiation use area or work with RAM or RPDs unless that individual has been designated a radiation worker, been properly briefed and has been issued a dosimeter, if appropriate. Visitors to any restricted areas shall be accompanied by persons knowledgeable about the protection and safety measures in the area and must be provided adequate information and instruction before entering the area.

3.2. Periodic monitoring will: Be conducted with portable ion chamber radiation survey instruments by the BEF and other authorized personnel IAW AF Technical Orders, Manuals and Instructions.

Chapter 4

ALARA AND TRAINING

4.1. Background. The ALARA concept was developed in response to scientific evidence which suggests that no level of radiation exposure is entirely risk-free. It is a policy which states that although there are acceptable, conservative levels of radiation exposure specified by federal regulations which offer a low risk of adverse health effects compared to the other hazards of life and occupation, it is prudent to make every effort to reduce exposures to the lowest levels reasonably achievable, thereby lowering the health risk associated with that exposure. In fact, individual and cumulative radiation exposures must be maintained as close to zero as possible given the type of activities involved, the state of technology, the risk to the individuals exposed and the benefit to society from the activity being accomplished.

4.2. General. Section 3.3 of AFI 48-148 specifies personnel that require initial and annual training.

4.2.1. Personnel requiring training in radiation safety commensurate with their duties may include: users, Supervisors, Radiation monitors, Permit RSOs, emergency response teams

4.2.2. Training shall be provided:

4.2.2.1. Before the individual is permitted to assume duties with or in the vicinity of radiation sources.

4.2.2.2. Annually during a refresher training course.

4.2.2.3. When there is a significant change in duties or radiation safety requirements.

4.2.3. Training shall be provided by the permit RSO, with the assistance of the IRSO

4.2.4. Training topics shall include but are not limited to the following:

4.2.4.1. Types and characteristics of radiation of concern.

4.2.4.2. Radioactivity, radioactive decay or x-ray production (as appropriate).

4.2.4.3. Modes of exposure – internal versus external.

4.2.4.4. The health risks posed by this exposure including: deterministic and stochastic effects, somatic and genetic effects, and effects on the unborn fetus.

4.2.4.5. General radiation protection principles including:

4.2.4.5.1. ALARA and dose limits.

4.2.4.5.2. External protection through time, distance and shielding.

4.2.4.5.3. Internal protection through respiratory protection, protective clothing and hygiene, as appropriate.

4.3. Use of instruments, equipment and personal dosimetry, as appropriate, to:

4.3.1. Identify sources of radiation emission and radioactive contamination; measure radiation exposure rates or dose rates; monitor individual radiation doses; emergency procedures; reporting requirements; RAM permit requirements, as appropriate; other

occupation specific hazards and the related skills and procedures required for working with the RAMs or RPDs of concern.

4.3.2. All radiation safety training shall be documented and copies maintained by the IRSO or permit RSO, as appropriate. Workplace supervisors shall ensure training is documented on each individual's AF Form 55, Employee Safety and Health Record, or electronic equivalent.

Chapter 5

REQUESTING AUTHORIZATIONS FOR RAM AND RPD USE

5.1. Air Force Use of RAM and RPDs

5.1.1. AF License. The AF has been issued a master materials license by the NRC. This license authorizes the AF RIC to grant AF RAM permits to AF organizations for possession and use of byproduct, source and special nuclear materials, normally controlled by the NRC.

5.1.2. AF Permits. TAFB tenant organizations have been issued AF RAM permits by the RIC authorizing the possession and use of RAM diverse types, forms and quantities.

5.2. Permit Requests. Organizations located at TAFB desiring to possess and use radioisotopes or RPDs must possess a NRC or Agreement State License, an AF RAM permit or must submit an application to possess and use such items, in letter form, 30 calendar days before bringing the material onto the installation, to the IRSO (72 AMDS/SGPB). These applications must be used for new permits, renewals of old permits or amendments to existing permits or authorizations.

5.2.1. This letter will contain the following:

5.2.1.1. The division, branch, section or unit to use or procure the radioisotopes or apparatus.

5.2.1.2. The name of the supervisor and all operating personnel.

5.2.1.3. The radioisotope, its chemical and physical form and activity in curies (Ci, mCi, μ Ci ...).

5.2.1.4. A complete description of its use.

5.2.1.5. The location: building number, room name/number and post location (or area if post location unavailable) in which the radiological operations are to be performed and where the device or material is to be stored.

5.2.1.6. A complete listing of radiation monitoring equipment.

5.2.1.7. The radiation safety precautions and description of the potential hazards to be encountered or anticipated.

5.2.1.8. A detailed statement of education, training and experience with radioisotopes of the designated individual user(s).

5.2.1.9. For RPDs include its description with manufacturer; make; model; the maximum output capacity, kilovolt peak (kVp) and milliamp (mA) and estimated duration of use (daily and hourly maximums; averages for week, month or year).

5.2.1.10. An operating instruction (OI) regarding the unit's ALARA program signed by the Unit Commander, Directorate or Equivalent indicating senior management support to implement the ALARA philosophy.

5.2.1.11. These requirements are NOT intended for possession or use of radioisotopes or RPDs for which organizations already have BEF permission to "use or possess" said items at the "date of publication" of this instruction. If there is any question about BEF permission, BEF should be contacted.

5.2.2. Activities originating purchase requests for RAM or RPD(s) will identify the materials on the purchase request as "Contains Radioactive Material" or "Produces Radiation" as appropriate. The originator will obtain and attach the IRSO's approval.

5.2.3. Further guidance for requesting template and non-template permits can be found in AFI 40-201, Section 3.4.

5.3. Generally Licensed Devices (GLD).

5.3.1. Units shall acquire GLDs IAW AFI 40-201, Attachment 3.

5.3.2. Upon receipt of GLD, unit shall notify BEF or IRSO of possession.

5.3.3. Units are required to coordinate with BEF or IRSO for disposing of GLDs from their inventory.

Chapter 6

RAM WASTE

6.1. Management of Radioactive Waste.

6.1.1. Generation of Waste. The primary goal of all users is to minimize the accumulation of radioactive waste to those items which cannot be disposed of in any other manner. One method is to avoid combining radioactive and non-radioactive waste such as paper products and ordinary laboratory waste. Care should be exercised not to inadvertently dispose of radioactive waste without regard to proper disposal procedures.

6.1.2. Segregation. An important aspect of proper waste disposal is segregation of waste, which may involve separating:

6.1.2.1. Solids from liquids. An example would be the separation of solid check sources from liquid scintillation vials.

6.1.2.2. High activity from low activity radionuclides.

6.1.2.3. Long half-life from short half-life radionuclides. Short half-life material may be decayed in storage and subsequently disposed of as non-radioactive waste if approved by the IRSO in writing.

6.1.2.4. Different categories of material. An example would be the separation of alpha emitting material from gamma emitting material.

6.1.3. Containerization. Supervisors of units with containers of RAM (i.e. barrels, crates, drums, boxes, etc.) shall ensure that each container is labeled with the minimum:

6.1.3.1. National stock number

6.1.3.2. Part number

6.1.3.3. Nomenclature

6.1.3.4. Quantity

6.1.3.5. Radionuclide

6.1.3.6. Activity

6.2. Excess Waste Disposal.

6.2.1. Excess or unserviceable RAM shall be disposed of IAW AFI 40-201. Supervisors, Unit RSOs and/or Permit RSOs shall contact the BEF (i.e. the IRSO) to ensure safe handling and shipping meet NRC, DoT, DoD and AF requirements.

6.2.2. Owning organizations shall provide BEF information as required in AFI 40-201, section A10.4, Disposal by Burial or Recycling. The BEF shall work with owning organizations on proper storage area(s) at their work sites as needed. Prior to the BEF receiving excess radioactive waste from any unit for temporary storage, the IRSO shall verify the radioactive contents of the containers.

6.2.3. Owning organizations are responsible for all costs associated with the disposal of RAM. In most cases this will entail the cost of shipping and may be covered by the AF Radioactive Recycling and Disposal Office (AFRRAD).

6.2.4. Shop Supervisors, Unit RSOs and Permit RSOs will ensure that personnel who use or possess RAM or commodities containing RAM are aware of the process for turn-in of excess RAM.

6.2.5. The IRSO will coordinate final shipping or transfer of the excess waste with the unit supervisor when disposition or recycling instructions are received from AFRRAD.

6.3. Oklahoma City- Air Logistic Complex (OC-ALC) RAM Disposal Process

6.3.1. All OC-ALC RAM waste should be stored in Bldg. 2137 unless building is unavailable for storage. In this event, OC-ALC will notify BEF where the RAM waste will be stored. This applies for aircraft that undergo depot maintenance here at Tinker AFB.

6.3.2. All OC-ALC shops generating RAM waste should contact the 776 MXSS/MXDEB office directly to coordinate the movement of RAM to Bldg. 2137

6.3.3. 776 MXSS/MXDEB shall communicate to the IRSO when Bldg. 2137 is nearing capacity. IRSO will then submit the request for Services form(s) to the AFRRAD indicating the RAMs which need disposal service. The AFRRAD will communicate with IRSO to schedule services. The IRSO will communicate the scheduled service dates to 776 MXSS/MXDEB as soon as the dates are confirmed with AFRRAD.

6.4. Defense Logistics Agency (DLA) RAM Disposal Process

6.4.1. All DLA RAM waste is accumulated in Bldg. 11. Contact the IRSO to coordinate the movement of RAM in and out of Bldg. 11. Notify BEF or IRSO if RAMs will be stored elsewhere.

6.4.2. DLA Radiation Protection Officer (RPO) shall communicate to the IRSO for RAM disposal. The IRSO will then submit Request for Services form(s) to the AFRRAD indicating the RAMs which need disposal authorization. The AFRRAD will communicate to the IRSO for authorized shipment.

6.4.2.1. Depending on the complexity of the RAM packaging and shipment, the AFRRAD might provide shipment and packaging services at the request of DLA through the IRSO.

6.4.2.2. RAMs sent to the DLA for temporary staging from the OC-ALC Item Managers shall be coordinated through the BEF or IRSO for disposal. These wastes do not generate in-house from the ALC. They are from the field. Hence, they do not go through the complex disposal process.

STEPHANIE P. WILSON, Colonel, USAF
Commander

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

Code of Federal Regulations (CFRs), current editions:

Title 10, Energy, Parts:

Part 20, *Standards for Protections against Radiation*

Part 30, *Rules of General Applicability to Domestic Licensing of Byproduct Material*

Part 33, *Specific Domestic Licenses of Broad Scope for Byproduct Material*

Part 40, *Domestic Licensing of Source Material*

Part 70, *Domestic Licensing of Special Nuclear Material*

Title 29, Labor, Part 1910, *Occupational Safety and Health Standards, Subpart 1096, Ionizing Radiation*

Title 49, Transportation, Part 173, *Shippers--General Requirements for Shipments and Packaging*

DoD Instruction 6055.8, *Occupational Radiation Protection Program*

AFI 40-201, *Managing Radioactive Materials in the US Air Force*, September 17, 2014

AFI 48-148, *Ionizing Radiation Protection*, November 20

AFI 91-108, *Air Force Nuclear Weapons Intrinsic Radiation Safety Program*

AFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*1, 2011

TO 33B-1-1, *Nondestructive Inspection Methods, Basic Theory* February

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AF RDL —Air Force Radiation Dosimetry Laboratory

AFRRAD —Air Force Radioactive Recycling and Disposal Office

ALARA —As Low As Reasonably Achievable

BEF —Bioenvironmental Engineering Flight

Ci —Curie

DoD —Department of Defense

DoE —Department of Energy

DoT —Department of Transportation

DLA —Defense Logistics Agency

DRMO —Defense Reutilization and Marketing Office

ESOHC —Environmental, Safety and Occupational Health Council

FAR —Federal Acquisition Regulation

GLD —Generally Licensed Device

MML —Master Materials List

NDI —Nondestructive Inspection

NARM – Naturally-Occurring or Accelerator—Produced Radioactive Material

NRC —United States Nuclear Regulatory Commission

OC-ALC —Oklahoma City Ai Logistics Complex

PWS —Performance Work Statement

RAM —Radioactive Material

RIC —United States Air Force Radioisotope Committee

RPD —Radiation Producing Device

RSO —Radiation Safety Officer or Radiation Protection Officer

SNM —Special Nuclear Material

SOO —Statement of Objectives

SOW —Statement of Work

TLD —Thermoluminescent Dosimeter

Terms

AF RDL - Air Force Radiation Dosimetry Laboratory—The USAF School of Aerospace Medicine, Occupational and Environmental Health (USAFSAM/OEHHD) Radiation Dosimetry Laboratory, Brooks City-Base TX.

AFRRAD - Air Force Radioactive Recycling and Disposal Office—The 88th Air Base Wing, Office of Environmental Management (88 ABW/EM), Wright-Patterson Air Force Base, OH.

ALARA - As Low As Reasonably Achievable—The principle that personnel exposures must be maintained as low as possible consistent with existing technology, cost and operational requirements.

Curie (Ci)—The Ci is a unit of radioactivity, defined as: $1 \text{ Ci} = 3.7 \times 10^{10}$ radioactive decays per second. This is roughly the activity of 1 gram of the radium-226 (^{226}Ra), a substance studied by the pioneers of radiology, Marie and Pierre Curie (for whom the unit is named). Typical units of measure in relation to the Curie are the milliCurie (mCi) and microCurie (μCi), 10^{-3} Ci and 10^{-6} Ci respectively.

IRSO – Installation Radiation safety Officer—An individual designated by the Installation Commander (72 ABW/CC) to manage the base radiation safety program. This individual will usually be a bioenvironmental engineer or health physicist, if assigned, but may be a Bioenvironmental Engineering Craftsman (AFSC 4B071). This individual conducts the base-

wide radiation safety program which includes surveillance of all RAMs and RPDs. The IRSO coordinates with and assists the unit, permit or license and medical facility RSOs as necessary to ensure a comprehensive and coordinated radiation safety program.

Permit RSO—An individual designated by the Unit Commander, directorate or equivalent and approved by the NRC, State of Oklahoma or RIC to manage the radiation protection aspects associated with the use of RAM or RPDs for which a specific NRC, State or RIC permit or license has been issued.

Unit RSO—An individual designated by the Unit Commander to act as the single focal point for the unit on radiation protection matters. A Unit RSO will be appointed for each operational unit which operates RPDs or uses RAM. The Unit RSO may also be a permit or other RSO. This individual coordinates radiation surveys or hazard evaluation activities with the IRSO or permit/license RSO; assists in investigation of suspected or actual overexposures and performs those radiation protection duties at the unit level which are commensurate with his/her training and experience. For units that are required to have radiation permits/licenses or have personnel on the TLD program, a specially designated Unit RSO must be appointed.

Radioisotope—Radioactive isotope is an isotope of an element or atom whose number of neutrons makes the element radioactive. Radioisotopes may refer in general to materials that contain radioactive isotopes, i.e. RAM.

TLD - Thermoluminescent Dosimeter—A TLD is a type of dosimeter, an instrument that measures the amount of radiation absorbed in a given period. A TLD measures ionizing radiation exposure by measuring the amount of visible light emitted from a crystal in the detector when the crystal is heated. The amount of light emitted is dependent upon the radiation exposure.