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**Medical Command**

**RADIATION (IONIZING) SAFETY PROGRAM**

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This instruction describes the responsibilities of all personnel involved with the control and use of radioactive material (RAM) and radiation-producing devices (RPD). It also describes necessary procedures for the implementation of an effective radiation safety program at Wright-Patterson Air Force Base (WPAFB). This instruction applies only to ionizing radiation sources. Nonionizing radiation sources such as lasers and microwave emitters are not covered by this instruction. Governing directives for the radiation safety program are DoDI 6055.8, *Occupational Radiation Protection Program*, AFPD 40-2, *Radioactive Materials (Non-Nuclear Weapons)*, AFI 40-201, *Managing Radioactive Materials in the USAF*, AFI 48-125, *The USAF Air Force Personnel Dosimetry Program* and AFI 48-148, *Ionizing Radiation Protection*.

This instruction requires collecting and maintaining information protected by the Privacy Act of 1974 authorized by Section 20.401(a) and (c), 10 Chapter I, Code of Federal Regulations (10 CFR 20.401(a)(c)) as directed by E.O. 12196, 29 CFR 1910.96(b)(2)(iii), (n) and (o), implemented by Air Force Regulation 161-28, Personnel Dosimetry Program and the USAF Master Radiation Exposure Registry. System of records notice F044 AF SG O, *United States Air Force Master Radiation Exposure Registry* applies.

**SUMMARY OF REVISIONS**

This revision implements and reflects 10 CFR Part 20, *Standards for Protection Against Radiation*, and 10 CFR Part 19, *Notices, Instructions and Reports to Workers: Inspection and Investigations*, published by the US Nuclear Regulatory Commission (USNRC). This revision also updates the correct reference from USAF regulations to instructions.

Section A	Responsibilities	3
Section B	Permits For the Possession and Use of RAMs and RPDs	7

Section C	Designation of Areas	9
Section D	Exposure Limits	10
Section E	Dosimetry	11
Section F	ALARA	15
Section G	Training	16
Section H	Ordering and Receiving Radiation Sources	17
Section I	RAM Work Procedures	18
Section J	Leak Testing of RAM	19
Section K	Radioactive Waste	19
Section L	Posting Requirements	23
Section M	Emergency Procedures	23
Section N	Reporting Requirements	26
Section O	Radon.	28

*Section A—Responsibilities***1. The Commander, 88th Air Base Wing, WPAFB, listed hereafter as the Installation Commander, is responsible for:**

- 1.1. Ensuring that all installation personnel comply with this instruction. This includes military personnel, civilian employees, contractor personnel and visitors.
- 1.2. Ensuring that all installation activities comply with applicable federal and USAF directives covering the usage of radiation-producing devices the permitting, procurement, storage, handling, accountability for and disposal of RAMs and the reporting of incidents or accidents to the appropriate authorities.
- 1.3. Conducting a installation-wide radiation safety program through the Office of Environmental Management (EM) under the direction of a WPAFB radiation safety officer (WPAFB RSO).
- 1.4. Certifying, in writing, that WPAFB is committed to the successful implementation of an as low as reasonably achievable (ALARA) program.
- 1.5. Designating the Installation RSO (WPAFB RSO) in writing.
- 1.6. Ensuring that the WPAFB RSO is notified of all planned uses of radioactive material and radiation-producing devices (RPD) on the installation.
- 1.7. Enforcing the rule that non-Air Force organizations must have proper authorization to use radioactive materials and radiation-producing devices on the installation.

**2. The Commander, 74 Medical Center , WPAFB, listed hereafter as the Medical Center Commander, is responsible for:**

- 2.1. Conducting a medical center radiation safety program under the direction of a medical center radiation safety officer (MC RSO). This individual will be responsible for the radiation safety program within the medical center.
- 2.2. Designating a qualified physician to be a member of the WPAFB Radiation Safety Committee (WPAFB RSC).
- 2.3. Ensure complete records are maintained of either measured or estimated radiation dose received by personnel during occupational practices and contingency operation in the member's medical record.

**3. The WPAFB RSC reviews proposals for the use of licensed radiation sources and makes recommendations to the commander concerning the protective measures to be taken. The WPAFB RSC also includes RPDs in its purview. The WPAFB RSC consists of a chairperson designated by the Installation Commander representing the executive management of WPAFB; a secretary who is the WPAFB RSO; the MG RSO; a representative of Installation Safety, and members representing each major Installation and tenant organization which uses RPD or RAM. Other individuals, because of special qualifications or management position, may be nominated and approved for membership by the existing members as appropriate. Adjunct members may also be selected to represent such areas as security and housekeeping. Adjunct members are nonvoting. The WPAFB RSC will meet at least once each calendar quarter and a quorum will consist of two thirds of the voting membership including the WPAFB RSO and the representative of the executive management of WPAFB. The WPAFB RSC is responsible for:**

- 3.1. Reviewing and approving protocols for unique uses of RAMs and RPDs by permitted activities.
- 3.2. Submitting reports to the Installation Commander concerning all actions taken. These reports will be in the form of minutes of each regularly scheduled and special meeting. Minutes will include a listing of members in attendance, members absent, discussions, actions, recommendations, decisions and results of all votes.
- 3.3. Reviewing training programs, equipment, facilities, supplies and procedures to ensure radiation safety.
- 3.4. Reviewing and approving the training and experience qualifications of the proposed WPAFB RSO before submission to the USAF Radioisotope Committee (RIC) for final approval.
- 3.5. Reviewing the annual ALARA report of the WPAFB RSO including results of any USNRC and USAF inspections.
- 3.6. Recommending remedial action to correct any deficiencies in the radiation safety program.
- 3.7. Reviewing actions taken as a result of recommendations made in mishap reports submitted per AFI 91-204, *Safety Investigations and Reports*.
- 3.8. Reviewing and recommending corrective actions for deficiencies identified by USNRC and USAF Inspector General (USAF IG) inspection.
- 3.9. May function as the Permit Radiation Safety Committee for RAM Permits on the installation.

#### **4. The WPAFB RSO is responsible for:**

- 4.1. Functioning as the secretary of the WPAFB RSC and advising the Installation Commander on all significant radiation safety related activities.
- 4.2. Directing, for the Installation Commander, the overall conduct of the WPAFB radiation safety program whose primary goal is to maintain radiation exposures to personnel ALARA. The WPAFB RSO is the individual designated by the Installation Commander and the WPAFB RSC to investigate, evaluate, initiate corrective action and report on defects or noncompliance items relating to substantial safety hazards involving RAMs or RPDs.
- 4.3. Enforcing all federal, Air Force, state and Installation rules and instructions relating to radiation safety.
- 4.4. Terminating any operation which, in the opinion of the WPAFB RSO, poses a substantial radiation safety hazard to personnel or the environment. A report of such actions will be made immediately to the Installation Commander.
- 4.5. Ensuring that personnel and area monitoring are accomplished as required by applicable rules and instructions.
- 4.6. Supervising, as a disaster control group member, emergency radiation safety operations in the event of accidents/incidents involving RAMs or RPDs.
- 4.7. Reviewing plans for facilities to be used for RAMs or RPDs which could require shielding.
- 4.8. Providing preliminary hazard evaluations for proposed uses of RAMs or RPDs.
- 4.9. Ensuring that the receipt, shipment and transfer of RAMs are properly monitored and identified.

- 4.10. Maintaining all necessary records of the WPAFB radiation safety program, USAF RAM permits, WPAFB RAM/RPD permits, including documentation in support of USAF and federal instructions, licenses and permits.
- 4.11. Identifying to the individual users and their supervisors the protective equipment and facilities necessary for the safe conduct of projects and programs involving the use of radiation.
- 4.12. Coordinating with the WPAFB RSC on all significant matters involving radiation safety.
- 4.13. Providing a personnel dosimetry program for employees involved in ionizing radiation projects, which includes tracking dosimetry results and establishing investigation levels to ensure exposures to personnel are maintained ALARA.
- 4.14. Manage the distribution and record-keeping requirements of the personnel dosimetry and bio-assay program for occupational exposures.
- 4.15. Managing the environmental surveillance program relative to radiation safety and ensuring compliance with applicable federal, Air Force, state and WPAFB instructions and directives dealing with protection of the public and the environment from unwarranted radiation exposures.
- 4.16. Managing and controlling the radioactive waste disposal program which ensures proper packaging, storage, transport and disposal of radioactive waste by WPAFB organizations.
- 4.17. Managing the issuance of WPAFB RAM/RPD permits and Generally Licensed Device Registrations to organizations requiring authorization to use RAMs and radiation-producing devices.
- 4.18. Monitoring the radiation safety training program for permit RSOs, supervisors, radiation monitors, users of RAMs and RPDs and emergency response team members. Radiation safety training provided by others, such as military public health, permit RSOs or supervisors will be approved by the WPAFB RSO.
- 4.19. Managing the WPAFB RAM and RPD inventory.
- 4.20. Providing emergency response capabilities in the event of accidents involving contamination of personnel or the environment or exposure of personnel to RAMs or RPDs (according to the WPAFB disaster control plan, if applicable).
- 4.21. Providing expert consultation, advice, assistance and direction on the hazards associated with radiation and the methods to control these hazards as well as response to emergency incidents or accidents involving RAM or radiation-producing device.
- 4.22. Managing an inventory of calibrated radiation monitoring equipment and dedicated check sources for use in routine radiological surveillance and compliance surveys as well as immediate response to emergency situations.
- 4.23. Establishing the required frequency of area surveys.
- 4.24. Establishing instructions on how non-Air Force organizations obtain approval to use RAM and RPD on the installation.
- 4.25. Providing for a RAM recycling and recovery service for excess radioactive material in the USAF inventory and Federal installations with a valid Memorandum of Agreement.
- 4.26. Overseeing routine decontamination and site remediation activities.

**5. Commanders of organizations which use RAMs or RPDs are responsible for:**

- 5.1. Designating an individual to act as the single focal point for the organization on radiation safety matters.
- 5.2. Ensuring that qualified radiological monitors are designated for each functional area authorized to possess and use RAMs or RPDs.
- 5.3. Assuring the timely reporting of accidents or incidents involving RAMs or RPDs to the WPAFB RSO and according to AFI 91-204.
- 5.4. Ensuring that an ALARA training program is in place.
- 5.5. Ensuring that an annual internal audit is completed.
- 5.6. Ensuring the maintenance of records and reports required by NRC and AF regulations.

**6. Permit RSOs or commander designated individual are responsible for:**

- 6.1. Advising the WPAFB RSO of the proposed uses of RAMs or RPDs by individuals within the organization and advising the WPAFB RSO of any matters affecting the radiation safety program of the organization.
- 6.2. Coordinating radiation survey or hazard evaluation activities with the WPAFB RSO.
- 6.3. Performing those radiation safety duties at the organizational level that are commensurate with training and experience.
- 6.4. Assuring the timely reporting of accidents or incidents involving RAMs or RPDs to the WPAFB RSO, organizational commanders and according to AFI 91-204.
- 6.5. Assisting in the investigation of incidents or accidents relating to the use of RAMs or RPDs.
- 6.6. Ensuring that radiation areas and locations where RAM are stored and used are properly posted.
- 6.7. Performing or arranging with the WPAFB RSO radiation safety training of newly assigned employees, students or workers who may be occupationally exposed to ionizing radiation and likely to receive greater than 100 mrem in a year.
- 6.8. Coordinating with the WPAFB RSO before initiating any project including procurement, use, storage and or disposal of RAMs or devices or any changes in working conditions or activities which could affect the radiation safety program. All coordination will be accomplished prior to initiation of the project.
- 6.9. Submitting to the WPAFB RSO for review any new or revised operating instructions (OI), standard operating procedures (SOP) or unit instructions impacting on the radiation safety program prior to implementation.
- 6.10. Ensuring that all users are familiar with radiation safety OIs and radiation safety procedures and the WPAFB ALARA program.
- 6.11. Ensuring that radiation personnel monitoring devices, when required, are issued and worn correctly by all users.

6.12. Advising the WPAFB RSO, in writing, of any proposed changes to the RAM inventory, any proposed acquisition of new RPDs or any proposed generation of radioactive waste. Such notice will be submitted with sufficient lead time to permit adequate review and comment.

6.13. Issuing orders, as appropriate, to cease and desist any permit activity if unsafe practices are being used, gross negligence is observed or a failure to follow established procedures, policies or regulations is identified.

**7. Each individual using RAMs or RPDs is responsible for:**

7.1. Learning and implementing the rules of radiation safety as described in applicable federal, Air Force and WPAFB instructions as well as in organizational OIs.

7.2. Wearing personnel monitoring devices if directed by their supervisors and the WPAFB RSO.

7.3. Wearing appropriate protective clothing and equipment as prescribed by supervisors and the WPAFB RSO.

7.4. Becoming familiar with the ALARA program which is dedicated to maintaining exposure to ionizing radiation ALARA.

7.5. Reporting incidents/accidents and hazardous conditions immediately to their supervisor or the WPAFB RSO if appropriate.

7.6. Assisting the supervisor or the WPAFB RSO, as directed, to control the site of an accident/incident.

7.7. Informing their supervisor of any changes in equipment, procedures or other factors involving RAMs or RPDs which may alter the radiation safety practices or radiation levels in unrestricted areas.

**8. Jurisdiction:**

8.1. The WPAFB RSC and WPAFB RSO have complete jurisdiction over all radiation safety matters on WPAFB.

8.2. The MG RSC and MG RSO, specifically named on a USAF RAM permit are hereby delegated responsibility for all radiation safety matters within the Medical Center. The MC RSO will make available for review by the WPAFB RSO all reports concerning x-ray evaluations, RAM storage area evaluations, exposure investigations and any other documentation such as the annual ALARA report which concerns radiation safety.

***Section B—Permits For the Possession and Use of RAMs and RPDs***

**9.** The USAF has been issued a master materials license by the USNRC. This license authorizes the USAF RIC, located at Bolling AFB in Washington D.C., to grant USAF RAM permits to Air Force organizations for possession and use of byproduct, source and special nuclear materials, normally controlled by the USNRC.

**10.** In addition, the USAF RIC has reserved the authority to grant USAF RAM permits for the possession and use of RAMs not under the jurisdiction of the USNRC. Examples of these materials are radium and accelerator-produced radionuclides.

**11.** WPAFB tenant organizations have been issued USAF RAM permits by the USAF RIC authorizing the possession and use of RAMs of diverse types, forms and quantities.

**12.** The WPAFB RSC has reserved the authority to control the possession and use of RPDs such as x-ray machines and accelerators that are not under the jurisdiction of either the USNRC or the USAF RIC.

**13.** Organizations located at WPAFB and contractors performing work at WPAFB must obtain a USNRC or Agreement State License and or a USAF or Navy RAM permit or WPAFB RAM/RPD authorization in order to possess or use RAMs or RPDs.

13.1. 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. Also included are accelerator-produced materials such as cobalt-57 as well as naturally-occurring radioisotopes such as radium. Excluded from the requirement for a permit is any item commonly available to the general public and not requiring a license. These items 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 WPAFB RSO for guidance. The possession and use of Generally Licensed devices distributed under 10 CFR Part 31 may require registration with the USAF RIC and must comply with certain USNRC and USAF requirements. Coordinate the purchase, acquisition, receipt, storage, use and disposal of such devices with the WPAFB RSO.

13.2. An 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 a WPAFB RPD permit. Some exceptions are television monitors, cathode ray tubes (CRT) and video display terminals (VDT) which are manufactured under the strict requirements of 21CFR1020.10. If there is any doubt as to the requirement for a permit, contact the WPAFB RSO for guidance.

**14.** Requests for USAF RAM or WPAFB RAM/RPD permits must be submitted in writing to the WPAFB RSO (88 ABW/EMO). Applications for either new permits, renewals of old permits or amendments to existing permits are reviewed by the WPAFB RSO who may either (a) reject the application, (b) return it for additional clarification, (c) refer it to the USAF RIC or WPAFB RSC for review, or (d) issue a permit. Once approved, organizations are required to comply with the statements made in their application as well as any additional conditions imposed by the WPAFB RSO and the WPAFB RSC and listed as a condition of the permit itself. Any changes in the activities or personnel specified in the permit must be accompanied by the submission of an application for amendment of the permit. Applications for amendments will be submitted in the same manner as the original permit or renewal application except that only those items being changed need be addressed.

15. A WPAFB RAM/RPD permit authorizes the possession and use of RAMs or RPDs. However, operations conducted under the conditions of the permit must be documented to ensure compliance with the WPAFB ALARA program.

**16. Contractors:**

16.1. Contractors who perform services involving the use of RAM under the auspices of their own USNRC or Agreement State License shall be required to provide a copy of that license to the WPAFB RSO well in advance of operations being conducted at WPAFB. For contractors licensed by an Agreement State, in addition to a copy of the license, a completed copy of USNRC Form 241, **Report of Proposed Activities in Non-Agreement States**, must be submitted to the WPAFB RSO. The WPAFB RSO will review the license to ensure that the material and activities are authorized. The contractor will be required to comply with all applicable sections of this instruction as it applies to safe use of RAM and the reporting of incidents or accidents to the WPAFB RSO. The WPAFB RSO will be notified when the operation is terminated.

16.2. Contractors who perform services involving the use of RAM under the auspices of a USAF RAM permit issued to WPAFB will comply with all requirements specified in this instruction.

16.3. Contractors who will be using RPDs will be required to obtain a WPAFB RPD permit from the WPAFB RSO as would any WPAFB organization. Coordinate such activities with the WPAFB RSO at least 30 days prior to bringing RPD's onto the installation.

16.4. For both RAM and RPD activities contractors shall provide a brief description of the work to be performed. Include the dates and locations where such activities will be performed. While working on the installation, the WPAFB RSO can make on-site inspections to ensure the contractor follows proper radiation safety practices and can suspend any operations deemed to be unsafe or in violation of USAF or USNRC regulations.

***Section C—Designation of Areas***

17. The following definitions are extracted from the 10CFR20:

17.1. "Restricted area" means any area, access to which is limited for the purpose of protecting of individuals against undue risks from exposure to radiation and RAMs.

17.2. "Radiation area" means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

17.3. "High radiation area" means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

18. The limits in the above definitions are specified in terms of "rem in one hour" not "rem per hour (rem/hr)." The difference between these two expressions is significant. If the limit was expressed as 0.005 rem/hr, then any measurement with a survey meter above 0.005 rem/hr would classify the location as a radiation area. However, when expressed as 0.005 rem in 1 hour, a measurement of 0.01 rem/hr could still be classified as a nonradiation area if the occupancy were limited to no more than 30 minutes each hour or if the radiation field were present for no more than 30 minutes each hour. Such might be the case for an

x-ray operation. Therefore, the classification of a radiation area must also consider the occupancy of the area and the duration of the radiation exposure.

### ***Section D—Exposure Limits***

**19.** Personnel who work with RAMs or RPDs may be exposed to radiation during the course of their employment. The goal of the radiation safety program at WPAFB 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.

**20.** Federal regulations (10CFR20) specify the maximum permissible dose limits for radiation workers, workers who are under 18 years of age, nonradiation workers (i.e., members of the general public) and embryo/fetus.

**Table 1. Radiation Workers.**

In Any Calendar Year	Radiation Workers	Workers Under 18
Whole body (TEDE)	5 rem	0.5 rem
Lens of eye	15 rem	1.5 rem
Skin or extremities	50 rem	5 rem

\*The whole body means, for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knee. TEDE means total effective dose equivalent.

**Table 2. Members of the Public.**

One year	100 millirem
In Any One Hour	2 millirem

20.1. The dose in any unrestricted area resulting from USAF controlled radiation sources will not exceed the limits specified above. The installation RSO shall be responsible for the assessment, either by measurement or calculation, that these dose limits are not exceeded and shall maintain such records for a period of three years. If integrated radiation levels could exceed these limits, the area must be restricted.

**Table 3. Embryo/Fetus**

Entire pregnancy	500 millirem
Monthly	50 millirem

### **21. Occupational Exposure of Fertile Females:**

21.1. Each female who may be occupationally exposed to ionizing radiation will be informed by the WPAFB RSO or a member of the staff of the risks to the unborn.

21.2. A female military member shall, on becoming aware she is pregnant, notify her workplace supervisor or primary care manager. A non-military member should notify her workplace supervisor

or primary care manager. A civilian's woman's decision to declare her pregnancy is entirely voluntary. Declaration of pregnancy shall be in writing and include the estimated date of conception, for the radiation exposure limits of the embryo/fetus to be applied.

21.3. The WPAFB RSO may limit specific duties of a declared pregnant female who is occupationally exposed to radiation and who in the opinion of the WPAFB RSO may receive a whole body exposure greater than 500 millirems per year, either in the course of routine duties or as a result of a credible accident involving the RAM or RPDs. The WPAFB RSO's evaluation will include consideration of the workplace and the source of radiation, the individual's past history of exposure to radiation as documented by personnel dosimetry records, current radiation measurements applicable to her specific tasks, current exposure histories of coworkers, and likely exposures which would be incurred in the event of a credible accident.

21.4. If the RSO determines it is unlikely that the declared pregnant female would receive a total exposure during the term of the pregnancy (including the period preceding the confirmation of the pregnancy) in excess of 500 millirems, she may continue in her radiation-related duties. However, if the individual is not already on the Air Force personnel dosimetry program, she will be enrolled for the duration of her pregnancy. Arrangements will be made with Air Force Institute for Operational Health (AFIOH)/Radiation Dosimetry (SDRD) to receive, in addition to the laboratory's routine written report, telephone notification of the individual's dosimetry results as soon as each dosimeter is processed by the laboratory. Should exposure results indicate a trend which, if continued, could result in exceeding the 500 millirem limit, a re-evaluation will be made as to whether she should continue her radiation duties, be restricted from certain high risk duties, or be removed entirely from occupational exposure.

21.5. Special consideration must be made when a declared pregnant worker's radiation duties involve the operation of high output sources or the use of unsealed RAMs. Pregnant workers will not continue in duties involving these sources without the concurrence of HQ AFMSA/SGPR. When a pregnancy is suspected and reported to the immediate supervisor, women working with such sources or materials will receive a prompt evaluation by the WPAFB RSO (within five workdays after receipt of the consult request) and, if warranted, actions such as restrictions or removal may be taken even prior to confirmation of the pregnancy.

### *Section E—Dosimetry*

**22.** Individuals who routinely work with or in the vicinity of sources of ionizing radiation may be designated as radiation workers by the WPAFB RSO after an evaluation of the potential hazards. Radiation workers are issued radiation dosimeters which are exchanged either monthly or quarterly depending on whether the work environment has been determined by the WPAFB RSO to pose a normal or low risk of radiation exposure: In certain circumstances, radiation workers may also be issued self reading pocket dosimeters in addition to standard radiation dosimeters to permit immediate evaluation of a potentially hazardous radiation environment.

**23.** Air Force radiation dosimeters will only be issued to military or civilian government employees or contractors working with government owned and operated radiation sources. Contractors using contractor owned and operated radiation sources will be required to provide dosimeters to their own personnel.

**24. The WPAFB RSO and his/her staff are responsible for:**

- 24.1. Determining whether radiation monitoring is required.
  - 24.2. Determining the frequency of radiation monitoring.
  - 24.3. Issuing and exchanging radiation dosimeters.
- 25.** It is the responsibility of the supervisor of a newly assigned worker to request radiation monitoring for that individual. Monitoring will be required if the worker will be located in an area designated by the WPAFB RSO as a potential radiation hazard area or if, because of the assigned duties, the individual can be classified as a radiation worker.
- 26.** Each individual to be monitored will 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. The installation RSO shall ensure that each individual monitored is provided with the summary results of dosimetry (internal and external) annually on AF Form 1527-1.
- 27.** The supervisor will reinforce this information by introducing the dosimeter monitor who will indicate the dosimeter storage location and describe the procedures for requesting a review of the dosimetry results maintained by the supervisor.
- 28.** The supervisor will not permit anyone to enter a radiation area or work with RAMs or RPDs unless that individual has been designated a radiation worker, been properly briefed, and been issued a dosimeter, if appropriate. Visitors to any restricted areas must 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. Visitors entering a radiation area or a high radiation area or that could incur a deep dose equivalent of greater than 10 millirems shall be provided personnel monitoring devices. In those rare instances where it is essential for visitors to enter such restricted radiation areas for brief periods and where they may receive greater than 10 millirems, the supervisor will ensure that each visitor is provided with a self reading pocket dosimeter or other radiation monitoring device and that the following information is recorded and a copy provided to the WPAFB RSO:
- 28.1. Name.
  - 28.2. Organization/Address.
  - 28.3. Telephone No.
  - 28.4. SSAN.
  - 28.5. Dosimeter Serial No.
  - 28.6. Initial and final dose readings (if direct reading).
  - 28.7. Date, time and duration of visit.
  - 28.8. If at all possible, prior coordination with the WPAFB RSO concerning visitor access to restricted radiation areas should be accomplished.
- 29.** Monthly or quarterly, as applicable, a report of the exposures recorded on the dosimeters is published (AFIOH Listing 1499). This report is sent to the WPAFB RSO who reviews the results to determine if the exposures recorded are in compliance with the ALARA program. After review of the report, the WPAFB

RSO forwards a copy to the supervisors of the personnel monitored. These results are available to radiation workers for review.

**30.** There are several types of dosimeters which may be issued and specific rules governing proper wear of dosimeters:

30.1. Thermoluminescent dosimeter (TLD) badges are issued to monitor personnel for radiation exposure. 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. The first type is called a whole body badge. As indicated by its name, it is designed to measure the radiation exposure to the entire body. Obviously, no badge which is approximately 1 by 2 inches can measure the radiation exposure to the whole body. However, the badge should be worn at the location of highest expected whole body radiation dose. The whole body badge is typically worn somewhere between the waist and the shoulders (i.e., waistband, collar or shirt pocket). In this location, the badge will provide a measure of the radiation exposure to the internal organs and the gonads. If as is generally the case, the individual normally faces the radiation source, the badge should be worn on the front. However, if in some unusual instance, the radiation source is routinely behind the individual, the badge may be worn on the back. Since this badge is designed to provide a measure of the radiation exposure to the whole body, it should always be worn so as to be exposed to the same radiation environment as the body.

30.2. The second type of badge is called the collar badge worn on the shirt collar. It is designed to provide a representative sample of the radiation exposure to the critical organs above the shoulders, i.e., the thyroid in the neck and the lens of the eye. When a protective shield such as a lead apron is worn, the collar badge is placed outside the protective shield not under it. Results recorded on a collar badge are often reported as a "head" dose.

30.3. The third type of badge is called an extremity badge or finger badge. It is worn like a ring on a finger of the hand which is most likely to be exposed to the radiation. If the source of radiation is typically held in the hand, the ring should be worn with the top portion turned around facing the palm and the radiation. However, if the radiation originates from a remote source such as an x-ray diffraction unit and the hand is likely to be exposed from the back, the ring should be worn in the usual manner.

30.4. If dosimeters are issued and irrespective of how many other dosimeters are assigned, a whole body dosimeter is always worn by a radiation worker. Any other badges issued are worn in addition to the whole body badge--never in place of it. The reason is, simply stated, that the collar and finger badges measure radiation exposure only to specific organs of the body whereas the whole body badge measures the radiation exposure to the most critical organs.

30.5. All radiation badges should be worn while working in a designated radiation area. The badges should be put on before beginning work and removed after leaving the radiation 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 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 WPAFB RSO to estimate the exposure actually received during that monitoring period. The individual to whom the badge was issued will be required to sign a statement explaining the circumstances of the loss or damage.

30.6. In addition to routinely issued radiation monitoring badges, some activities in which there is a higher risk of a large exposure also require the use of self reading pocket dosimeters. Unlike TLDs which record the exposure but must be sent to the AFIOH in San Antonio, TX for processing resulting in a delay of several weeks before the results are obtained, pocket dosimeters are designed to be evaluated immediately. Although traditionally not as accurate as TLDs, self reading pocket dosimeters do provide an instant indication as to whether an exposure has occurred. For this reason, self reading pocket dosimeters are issued to visitors likely to receive greater than 10 millirems so that it can be determined if an exposure has occurred before the visitor is lost to follow-up.

30.7. If anyone suspects that a dosimeter has been exposed either deliberately or unintentionally to radiation irrespective of whether it was being worn at the time or not, the supervisor and the WPAFB RSO will be notified immediately. The dosimeter will be collected and shipped to AFIOH at Brooks City Base in San Antonio, TX for processing. If there is some evidence (such as survey meter readings or self reading pocket dosimeter results) that an individual was, in fact, overexposed, the WPAFB RSO will be notified immediately.. In the event that the installation RSO is notified by AFIOH that an overexposure may have occurred, the RSO shall immediately contact the Unit Commander and request the individual be removed from all duties involving potential radiation exposure until an investigation is completed. The RSO shall investigate suspected overexposures and provide a written report within seven days through the MAJCOM Bioenvironmental Engineer to AFIOH/SDRD and AFMSA/SGZR. Similar procedures shall be followed if the RSO is notified by an individual, or suspects, that an overexposure may have occurred.

**31.** In addition to federally imposed dose limits, the USNRC has also recommended the adoption of investigation levels for radiation workers. These levels are not legal limits. They are values arbitrarily set at 10 percent of the federally mandated limits to assist radiation safety program monitors to comply with the ALARA concept by anticipating potential difficulties and initiating corrective actions. Therefore, investigations will be accomplished in a timely manner by the WPAFB RSO for doses received by individuals in excess of the established ALARA levels. The investigation shall consider each such exposure in comparison with those of others performing similar tasks.

**Table 4. Investigative Levels.**

<b>Per Monitoring Period</b>	<b>Radiation Workers (millirem)</b>
Whole body (TEDE)*	125
Lens of eye	375
Skin or extremities	1250

\*The whole body means, for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knee.

**Section F—ALARA**

**32.** 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. The guidance contained in this instruction provides the basis for conducting an effective ALARA program.

**33.** The radiation safety program at this installation is managed by the WPAFB RSO and reviewed by the WPAFB RSC for the Installation Commander. WPAFB is committed to the concept of ALARA. The ALARA commitment is summarized below:

33.1. Management (88 ABW/CC):

33.1.1. The management of WPAFB is committed to the ALARA program for maintaining individual and collective radiation doses ALARA. According to this commitment, WPAFB has developed an administrative organization and written policies, procedures and instructions to promote the ALARA concept. The organization consists of the WPAFB RSC and the WPAFB RSO.

33.1.2. The management of WPAFB will review and sign the annual ALARA report prepared by the WPAFB RSO and approved by the WPAFB RSC.

33.1.3. The management of WPAFB will authorize modifications to operating and maintenance procedures and to equipment and facilities if they will reduce exposures unless the cost is considered unjustified. If requested, verification will be provided that improvements have been sought, that modifications have been considered and that they have been implemented when reasonable. If modifications have been recommended but not implemented, management will be prepared to describe the reasons for not implementing them.

33.2. WPAFB RSC:

33.2.1. The WPAFB RSC will delegate authority to the WPAFB RSO for enforcement of the ALARA program and will support the WPAFB RSO when it is necessary to assert authority. If the WPAFB RSC overrules the WPAFB RSO, the facts and basis for such action will be documented in the minutes of the WPAFB RSC meeting.

33.2.2. The WPAFB RSC may require users to develop new procedures to implement the ALARA concept and will review occupational radiation exposure records to ensure compliance with ALARA.

33.3. WPAFB RSO:

33.3.1. The WPAFB RSO will thoroughly review the qualifications of each applicant for a WPAFB RAM/RPD permit to ensure that the applicant will be able to take appropriate measures to maintain exposures ALARA.

33.3.2. The WPAFB RSO will perform semiannual reviews of the radiation safety programs and present the findings to the WPAFB RSC.

33.3.3. The WPAFB RSO will perform a quarterly review of radiation exposure records and records of radiation surveys and present the results to the WPAFB RSC each quarter.

33.3.4. The WPAFB RSO will ensure users, workers, and ancillary personnel are provided briefings describing the ALARA program at least annually.

33.3.5. The WPAFB RSO will encourage users to submit suggestions for improving health physics practices and increasing the effectiveness of the ALARA program and will evaluate them with the goal of implementing as many of them as are considered acceptable and reasonable.

33.3.6. The WPAFB RSO will investigate all deviations from ALARA and direct changes when appropriate.

33.4. Users:

33.4.1. Users will provide the WPAFB RSO with information concerning newly proposed uses of RAMs or RPDs with sufficient lead time to permit the RSO to adequately evaluate the proposal. Alternate approaches will be considered in the interest of ALARA.

33.4.2. Users will explain the ALARA concept to individuals supervised by them, ensure that they understand the concept and are adequately trained for the task required and document the training.

33.4.3. Radiation Workers:

33.4.4. Workers will be instructed annually in the ALARA concept and its applicability to work practices and conditions

33.4.5. Workers will be advised of available recourses if they feel that the ALARA concept is not being implemented.

### ***Section G—Training***

**34.** Personnel requiring training in radiation safety commensurate with their duties may include:

34.1. Users.

34.2. Supervisors.

34.3. Radiation monitors.

34.4. Permit RSOs.

34.5. Emergency response teams.

34.6. Special inspection groups (SIG).

34.7. Ancillary personnel (such as housekeeping) who may perform duties in areas where RAMs or RPDs are used.

**35.** Training will be provided to individuals who in the course of their duties are likely to receive in a year an occupational dose in excess of 100 millirems:

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

35.2. Annually during a refresher training course.

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

**36. Training will be provided by:**

36.1. The permit RSO, with the assistance of the WPAFB RSO, according to the above schedule.

36.2. The Department of Occupational Health, Health Education Office (74 Med Group/SGPM) during annual occupational safety briefings to workers. The contents of these briefings as they relate to radiation safety will be approved by the WPAFB RSO.

**37. Training sessions will include but are not limited to the following:**

37.1. Applicable regulations and permit conditions.

37.2. Areas where radiation sources are used or stored.

37.3. Potential hazards from the radiation sources.

37.4. Appropriate radiation safety procedures.

37.5. Work rules pertaining to radiation sources.

37.6. Employee obligation to report unsafe conditions or practices.

37.7. Initial response procedures to radiation emergencies.

37.8. Employee right to be informed of occupational radiation exposure results.

37.9. Location where pertinent regulations and documents are available for review.

37.10. Practices and procedures to ensure personnel exposures are maintained ALARA.

**38.** All radiation safety training will be documented and copies maintained by WPAFB RSO or permit RSO, as appropriate. When such training is required under this section, workplace supervisors shall ensure it is documented on each individual's AF Form 55, Employee Safety and Health Record.

***Section H—Ordering and Receiving Radiation Sources***

**39.** No one may order or receive RAMs or RPDs without first obtaining a USAF RAM or WPAFB RAM/ RPD permit for possession and use of the material or device.

**40.** Individuals or organizations who are issued a valid USAF RAM, USN RAM or a WPAFB RAM/RPD permit may order RAMs or RPDs authorized by their permit. When placing orders, the following actions will be accomplished:

40.1. The order must be forwarded to the WPAFB RSO through the permit RSO prior to submission to procurement.

40.2. If an order is to be verbal (i.e., placed by phone or directly to a visiting supplier) the WPAFB RSO must be notified immediately by phone of the intent to order and this will be followed within five workdays by a written notification to the WPAFB RSO.

40.3. The WPAFB RSO will review the order to ensure it does not exceed the USAF RAM or WPAFB RAM/RPD permit authorization, will file a copy of the request with the permit, and forward the original to procurement or provide verbal authorization for immediate action.

40.4. The purchase order request will specify that the WPAFB RSO will be contacted at extension 72010 during normal duty hours on receipt of the item at any location on WPAFB. If the package contains RAM and appears to be damaged or leaking, the WPAFB RSO will be notified immediately through the WPAFB Consolidated Command Post at extension 76314 irrespective of the day or time.

40.5. On notification that the item has arrived at WPAFB, the WPAFB RSO will either send a member of the staff to inspect and monitor the package or merely request notification when the package is delivered to the user. Only the WPAFB RSO or the user shall open the package. The action taken will depend on the hazard associated with the particular item and the condition of the package.

40.6. After the package is opened by the user and the contents examined, the WPAFB RSO will be notified immediately if there is either a discrepancy between the items ordered and received or if the items appear damaged. If all items are as ordered and in acceptable condition, notification will be in writing to permit updating of the master WPAFB inventory (copies of shipping documents should be included).

**41.** Special precautions must be taken by the permittee when receiving and opening packages which contain RAM:

41.1. Visually inspect the package and, if damaged, notify the WPAFB RSO immediately.

41.2. Measure the exposure rate at the package surface and, if greater than expected, contact the WPAFB RSO.

41.3. Wear gloves if the package contains liquids and is to be opened.

41.4. Verify the contents with the packing slip.

41.5. Examine the integrity of the final source container.

41.6. If anything unusual is encountered contact the WPAFB RSO.

41.7. As specified in 10CFR20.1906, packages containing in excess of certain specified quantities of RAM must be monitored for external radiation and contamination within 3 hours after receipt during working hours and within 3 hours from the beginning of the next working day if it is received after working hours.

### ***Section I—RAM Work Procedures***

**42.** Although each work environment will necessitate individual work practices, the following procedures will be incorporated in all RAM work procedures:

42.1. Wear laboratory coats or other protective clothing at all times where unsealed RAMs are used.

42.2. Wear disposable gloves at all times while handling unsealed RAMs.

42.3. Before leaving restricted areas where unsealed RAM is used, monitor hands and clothing for contamination with an appropriately sensitive survey meter.

42.4. Areas in which unsealed RAMs are stored or used will be coordinated with the installation and Permit RSOs. No eating, drinking or smoking shall be permitted in these areas. In addition, cosmetics will not be applied in those areas and exposed portions of the body such as the face should not be touched

- 42.5. Do not store food, drink, or personal effects in areas where RAMs are stored or used.
- 42.6. If issued, wear personnel monitoring devices at all times while in areas where RAMs are used or stored.
- 42.7. Dispose of radioactive waste only in designated, labeled and properly shielded containers.
- 42.8. Do not pipette radioactive liquids by mouth.
- 42.9. Wash hands before eating, drinking, smoking or leaving work area.
- 42.10. Discard contaminated protective equipment such as rubber gloves and boots into segregated radioactive waste disposal containers.
- 42.11. Individuals with open wounds will not work with RAM without proper protection.
- 42.12. Items will not be placed in ordinary trash or flushed down nonapproved drains unless they are first checked for radioactivity with an appropriately sensitive survey meter.
- 42.13. In areas where unsealed RAMs are used, monitor surfaces after each use.

### ***Section J—Leak Testing of RAM***

**43.** Sealed sources of RAM are leak tested at intervals specified in the USAF RAM permits. Current requirements are:

- 43.1. Beta and gamma sources in excess of 100 microcuries - every 6 months.
- 43.2. Alpha sources in excess of 10 microcuries - every 3 months.

**44.** Leak testing will be accomplished by the permit RSO, WPAFB RSO or staff for analysis by WPAFB RSO or other that is licensed/permitted to perform the analysis.

**45.** Results will be maintained by the WPAFB RSO and a copy forwarded to the user along with an interpretation of the results and any actions required.

**46.** If contamination is detected in excess of acceptable limits (usually 0.005 microcurie), the source will be secured in an isolated area until arrangements can be made for the WPAFB RSO and staff to supervise decontamination of the item or packaging for shipment either to the supplier or an approved radioactive waste disposal site.

### ***Section K—Radioactive Waste***

**47. Responsibility.** Organizations possessing a valid RAM permit may generate radioactive waste during the course of their operations. Each organization will assume full responsibility for collection, packaging, storage and disposal of radioactive waste generated. If accomplished properly, the potential for contamination of the environment or subjecting personnel to unnecessary radiation risk, will be eliminated. Each organization will provide a secure, isolated area for temporary storage of its own waste, on-site, near the location where it is generated. Each site will be approved by the WPAFB RSO. If a holder of a USAF RAM permit, waste will not be stored for more than two years without specific approval by the USAF RIC. When a container is filled and ready for disposal or has been in storage for two years, the WPAFB RSO will be notified in writing. The WPAFB RSO will make arrangements for pickup of the waste by a

disposal contractor authorized by USAF Radioactive Waste Program Office. Contracts for pickup and disposal of radioactive waste will NOT be made by the generator.

**48. Management of Radioactive Waste.** To ensure safe handling of radioactive waste, the following guidance is provided. Any proposed deviations from this guidance must be submitted in writing to the WPAFB RSO and approval must be obtained prior to implementation of the alternative procedures.

48.1. 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 suggestion is to avoid combining radioactive and nonradioactive waste such as paper products and ordinary laboratory waste. This will reduce volume and cost and facilitate final disposal. However, in the interest of reducing nonessential waste, care should be exercised not to inadvertently dispose of radioactive waste without regard to proper disposal procedures. Guidance may be obtained from the WPAFB RSO. In general, most radioactive waste is generated in one of two ways:

48.1.1. Routinely, such as in a research laboratory.

48.1.2. Infrequently, such as when a device used for many years is no longer required. In this case, the WPAFB RSO should be contacted as soon as the item is identified as excess and the WPAFB RSO will provide specific directives for the proper management of the item. If the item is small, radiologically stable and presents no unusual hazard, the WPAFB RSO may elect to assume responsibility for the item, consolidating it with other similar items for more efficient disposal. If this is the case, the WPAFB RSO may store the items in a secure location until enough have accumulated to fill a shipping container.

48.2. Segregation. An important aspect of proper waste disposal is segregation of waste (i.e., separation of different types). Segregation may involve separating:

48.2.1. Solids from liquids. Examples are separation of solid check sources from liquid scintillation vials or separation of vials containing liquid scintillation fluid from surgical gloves, paper products and glassware which may be coated with the same fluid.

48.2.2. High activity from low activity radionuclides. An example is separation of sources which are less than one millicurie from sources which are greater than or equal to one millicurie (one millicurie arbitrarily selected).

48.2.3. Long half-life from short half-life radionuclides. An example is separation of sources which have half-lives less than 120 days from those which have half-lives greater than or equal to 120 days. Short half-life material may be decayed in storage and disposed of as nonradioactive waste if approved by the WPAFB RSO in writing. Decay in storage procedures are described in **paragraph 49.8**.

48.2.4. Different categories of material. An example is separation of alpha emitting transuranics such as plutonium and americium from gamma emitting byproduct material such as cobalt and cesium.

48.2.5. Chemical/biological waste from radioactive waste. An example is separation of radionuclides contained in animal carcasses from those contained in liquid scintillation vials.

48.2.6. Commercial radioactive waste disposal facilities typically have extremely conservative segregation and disposal criteria. Proper segregation will eliminate the possibility of having to reopen the container and separate the contents at some later date possibly subjecting personnel to

unnecessary radiation or chemical exposure. If there are any doubts as to the segregation procedures required, contact the WPAFB RSO.

48.3. Drums. Radioactive waste will only be collected in new or recently refurbished 30 or 55 gallon drums; size of the drum will be dependent on the rate at which waste material is accumulated. A drum should be chosen which can be filled in one year or less. The selected drum whether new or refurbished must show no extensive signs of weathering or mishandling (i.e., no rust or dents) and must have no openings other than the top lid (i.e., no bung holes, even if sealed). The gasket on the lid of the drum must be neoprene and no moisture is permitted inside the drum. The NSN for an acceptable 30 gallon drum is 8110-00-866-1728 while the NSN for an acceptable 55 gallon drum is 8110-00-082-2626. If there are any doubts as to the acceptability of a drum, contact the WPAFB RSO.

48.4. Liners. The drums used for radioactive waste shall have two transparent plastic liners or one 8 mm liner installed. The liners will be at least 4 mils thick and be appropriate in size for the drum used. They will be of sufficient length so that the top of each liner can be twisted into a tail long enough to be folded over onto itself and the inverted "U"-shaped end secured with duct tape. If there are any doubts as to the acceptability of the plastic liners, contact the WPAFB RSO.

48.4.1. Solids. If only solid waste is generated, the two plastic liners described above will be placed one inside the other directly inside the drum. Each liner will be sealed individually resulting in a double encapsulation.

48.4.2. Liquids. Liquids are not normally acceptable for radioactive waste disposal. Some liquids may be disposed of through the sanitary sewer, however, the requirements of paragraph 49.7 must be satisfied. Other liquids, such as contained in liquid scintillation vials are acceptable but must be collected separately from all other waste. The following is a summary of the procedures for packaging of liquid scintillation vials for disposal:

48.4.2.1. For collection of liquid scintillation vials, the first liner will be installed in the drum, followed by at least 5 inches of absorbent material such as NSN 7930-00-269-1272. The amount of absorbent material must be sufficient to absorb twice the amount of liquid, however, DO NOT pour the liquid into the absorbent material, leave it in the vials. The second liner will then be placed over this dry absorbent layer.

48.4.2.2. Thus the container will consist of the drum, a plastic liner, a layer of absorbent material and finally a second liner. The waste is placed inside this second liner. If the waste consists of liquid scintillation vials, the intact vials will be placed inside this inner liner. Once the inner liner is secured as described in paragraph 49.4, another 5 inches of absorbent material will be placed on top of this sealed inner liner before the outer liner is sealed. This top layer of absorbent material is intended to absorb the liquid should the drum be turned upside down.

48.4.2.3. The reason for this procedure is that at the disposal site, the drum and outer liner will be opened and the inner liner will be removed from the drum. Its contents will then be placed in a machine which will separate the liquid scintillation fluid from the vials. Therefore, no absorbent material or any other objects may be placed inside the inner liner. If there are any doubts as to the acceptability of the absorbent material or the packaging procedures, contact the WPAFB RSO.

48.5. Inner Containers. As items are deposited in the radioactive waste drum, it is recommended that smaller transparent plastic containers be used to hold routine quantities of waste generated. For example, the waste generated each day during an experiment may be placed in a separate plastic container

and sealed or the waste from each experiment (perhaps spanning several days) may be collected in a single plastic container and sealed. This procedure would permit a more detailed inventory of the drum contents prior to final sealing if there were any questions regarding the contents. Each smaller container could be removed and inspected without requiring the individual to sort through the actual waste which may pose a chemical/biological hazard, as well as radiological hazard.

48.6. Final Closure. When a drum is full and ready for disposal, the WPAFB RSO will be notified in writing. The WPAFB RSO or representative will visually inspect the drum and will initial the inventory sheets to indicate that proper procedures were followed. Current USAF policy requires a certified radioactive waste disposal broker may verify the contents and packaging before the container may be shipped. Since items packaged in the drum will not normally be removed for a detailed inventory, the WPAFB RSO will not assume responsibility for problems arising as a result of incorrect inventories. If any problems do arise regarding the contents of the drums, it will be the responsibility of the organization generating the waste to resolve those problems with guidance from qualified radiation safety or radioactive waste disposal personnel.

48.7. Disposal to Sanitary Sewer. Liquid radioactive waste may be disposed of through the sanitary sewer only if authorization is granted by the WPAFB RSO. The WPAFB RSO will review the types and amounts of material proposed for disposal and the procedures and will verify that such disposal is authorized and does not exceed the maximum permissible quantities established in 10CFR20.2003. If such disposal is deemed acceptable, the WPAFB RSO will designate and label a drain approved for liquid radioactive waste and only this drain will be used. Material will be flushed with a continuous stream of water (not a trickle) for the time indicated by WPAFB RSO.

48.8. DIS. DIS may be authorized for all radioactive waste with half-lives less than 120 days. It is encouraged for all radioactive waste with half-lives of 30 days or less. DIS is a procedure in which radioactive waste is placed in a storage container such as a drum and allowed to remain undisturbed for at least 10 half-lives. The material must be stable and must be maintained in a secure location where it will not be disturbed during the storage interval which could extend up to 1200 days under specifically authorized circumstances. Typically, storage will not exceed 300 days. After the 10 half-lives have elapsed, the remaining activity will be approximately one thousandth of the original activity but it must still be monitored by the WPAFB RSO using an appropriately sensitive survey meter to ensure that no radiation above background is detectable. For DIS to be most effective, radioactive waste must be segregated according to half-life. Ideally, each container would contain only radionuclides with the same half-life. However, more realistically, the radioactive waste should be segregated into several categories according to half-life, such as, 1-15 days, 16-30 days, 31-45 days, 46-65 days, and 66-120 days.

48.9. Incineration. Authorization to incinerate can only be granted by the USAF RIC through the WPAFB RSO and must be specified as a condition to a WPAFB RAM permit before it can be accomplished. Incineration will normally only be approved for cases where disposal to a commercial radioactive waste burial site is difficult or impossible such as for animal carcasses or mixed chemical/biological/radioactive waste where the incineration of the chemical and biological components is not restricted. Applicable federal and state air emission requirements must be complied with.

48.10. Specific Waste. The USNRC has authorized the disposal of some small quantities of radioactive waste as normal waste. This exemption applies only to carbon-14 (C-14) and hydrogen-3 (H-3) also known as tritium. Specifically, 10CFR20.2005, states that C-14 and H-3 may be disposed of without regard to radioactivity, if the amount is less than or equal to 0.05 microcurie per gram of medium

used for liquid scintillation counting or per gram of animal tissue averaged over the weight of the entire animal. This exemption does not eliminate the requirement to dispose of the scintillation fluid and carcasses according to applicable chemical and biological waste disposal instructions. In addition, the instruction requires records of the amount disposed be maintained to ensure compliance.

48.11. Records. Every item that is placed into a waste disposal drum, flushed down an approved drain, incinerated or allowed to DIS, must be recorded. A separate form will be maintained by the generator for each drum, each drain, and each incinerator and all of the columns listed on the form will be completed. If inner containers are used they should be numbered consecutively and the inventory should indicate into which inner container each item of waste was placed. When a drum is ready to be sealed for disposal or DIS, the WPAFB RSO must be informed in writing and three copies of the inventory form will be made. One copy of the inventory remains with the user, a second is sent to the WPAFB RSO. For drain disposal, the third copy should be posted near the drain, while for a drum, the third is affixed to the drum with a minimum amount of tape (not glue) to permit subsequent removal. This is necessary since only certain shipping/disposal labels are permitted on the drum when it is sent to the waste burial site.

### ***Section L—Posting Requirements***

**49.** Except as specified in paragraph **51.** of this section, copies of this instruction, 10CFR, applicable USAF permit, permit conditions, documents referenced in the permit and NRC Form-3, **Notice to Employees**, will be posted in at least one conspicuous location within each work area where activities involving the use of RAMs are conducted.

**50.** If posting of a document specified in paragraph **50.** is not practical with the exception of NRC Form 3, a notice may be posted which describes the document and states where it may be reviewed. Copies of the references listed in this instruction and other pertinent documents concerning the use of RAMs are maintained by the WPAFB RSO in building 89, area C, extension 72010. The notice shall state that the documents are available for review during normal duty hours.

**51.** The AL Listing 1499 lists each individual's radiation exposure record. This form is provided to supervisors at the end of each monitoring period and should also be made available for review.

### ***Section M—Emergency Procedures***

**52. Emergency Situations.** Potential radiation hazards may include:

52.1. Spills of RAM. A spill is not limited to liquids. Release of RAM from its container irrespective of the form of the material is considered a spill. The material may be in powdered form, liquid, gas, or a solid mass. Spills pose a hazard because of the potential for: (1) contamination of the environment, (2) contamination of the skin of personnel, (3) ingestion or inhalation of RAM, and (4) production of a high radiation field which may result in a radiation dose exceeding permissible limits even if the individual does not become externally contaminated. A spill may result from a simple incident such as the dropping of a container or it may result from a more serious event such as a fire or explosion.

52.2. Production of a radiation field by an x-ray machine, irradiator, accelerator or RAM (even if the material is completely contained). An x-ray machine, radioisotope irradiator, or accelerator may be emitting radiation when it is supposed to be off, such as; when a switch or circuit malfunctions and the

unit does not shut down when switched off or it may be emitting radiation into an area where it is not expected, such as; when an accelerator beam is deflected into the wrong experimental area. In these instances, individuals may be exposed to high radiation fields possibly without their knowledge.

### **53. Response Procedures:**

53.1. Differences in response to the two situations described above include:

53.1.1. For spills, the material must be confined to prevent further contamination and individuals/environment may require decontamination.

53.1.2. For radiation fields, individuals must be removed from the radiation field or the radiation source must be interrupted (e.g., turning off the x-ray machine or shielding the irradiator source).

53.1.3. For both cases, the primary concern is first, the protection of individuals in the vicinity including emergency response personnel and second, the protection of the environment. Life saving activities always take priority over other considerations. In fact relatively large personnel exposures may be permitted for life saving procedures. This, however, is a one time permissible exposure which can never be repeated. Essential first aid always takes precedence over decontamination.

53.2. Emergency procedures are divided into two categories:

53.2.1. The first category involves generic response procedures, that is, procedures applicable to most situations.

53.2.2. The second category involves site-specific response procedures, that is, procedures unique to a specific location or situation.

53.2.3. This instruction describes typical generic response procedures. Site-specific procedures are developed by the user during application for a WPAFB RAM permit. Copies of both generic and site-specific emergency response procedures are maintained by the WPAFB RSO and are made available to emergency response teams such as the fire department, security police and disaster preparedness. The WPAFB RSO will either direct or delegate responsibility for all RAM cleanup operations.

### **54. Generic Emergency Response Procedures:**

54.1. Spills. An acronym used by some groups to assist in recalling spill control procedures is SWIMS which stands for:

- Stop the spill.
- Warn others.
- Isolate the area.
- Minimize the exposure.
- Secure the area and prevent any nonfiltered exhaust.

**NOTE:** A somewhat more detailed explanation of the procedures is presented below:

54.1.1. Prepare for a spill by having a "spill kit" readily available complete with all of the items required to respond.

54.1.2. Advise all personnel not directly involved with the initial spill incident or the subsequent cleanup to evacuate the area. Anyone suspected of being contaminated during the incident or cleanup should not leave the area until monitored and decontaminated if necessary.

54.1.3. One individual should assume responsibility for immediate actions. This is not the time to argue protocol or seniority. Just as for CPR where the individual who starts CPR is in charge until he/she relinquishes control, so, in a spill, the individual who starts giving commands should continue to do so until a more qualified and knowledgeable individual arrives on scene.

54.1.4. Stop the spill if possible. This may involve turning a container right side up, capping it or throwing some material over the source to absorb or reduce the emissions. In either case, the benefit of performing this activity (e.g., preventing contamination from spreading to uncontrolled areas) must be balanced by the risk to the individual performing it (e.g., contamination, inhalation or exposure of the individual). If all of the contents have escaped from the container, don't waste time capping it.

54.1.5. Warn individuals not involved in the spill to evacuate the area. Designate someone to call for assistance. Call the WPAFB RSO and others, such as the supervisor, radiation monitor, or emergency response teams (e.g., fire department or ambulances) as required. The WPAFB RSO will ensure that all notifications required by AFI 40-201 and 10CFR20.2201 and 20.2202, are accomplished

54.1.6. Determine extent of the spill. If liquid or solid, try to mark boundaries. If gas, which areas are affected.

54.1.7. Secure nonfiltered exhaust and any other pathways outside the area (e.g., air vents, windows, drains, etc.).

54.1.8. Don protective equipment such as gloves, boots, anticontamination clothing (anti-C's), and respirators. Minimize the number of personnel involved. Protective gear such as self contained breathing apparatus (SCBA) and bunker suits used by firefighters will normally provide sufficient protection from contamination although monitoring should be accomplished prior to removing such equipment to prevent inadvertent contamination.

54.1.9. Measure radiation levels. Use meters, air samplers, etc.

54.1.10. Monitor all personnel. Obtain all information necessary to perform follow-up evaluations on personnel (e.g., name, address, phone numbers, SSAN, location at scene, duration of exposure, etc.). Check individuals for external contamination. If clothing is contaminated, remove it. If skin is contaminated, shower or wash, depending on available facilities. Although contamination should not be permitted to enter the sanitary system, personnel decontamination takes priority. Consider the need for internal evaluation (i.e., bioassay sampling such as urine, feces, nasal swabs, etc.). Bioassay samples are best collected immediately (provided external contamination of the sample is not a problem) and again after 24 hours. The WPAFB RSO will provide guidance on follow-up sampling intervals.

54.1.11. Monitor environment and surfaces. Clean up if contaminated and collect all waste in plastic bags and place in sturdy containers.

54.1.12. For fires, water should be used sparingly since it may tend to spread contamination.

54.1.13. RAM not involved in the incident should not be moved. Transporting sources to an alternate storage location during an incident to safeguard them is not recommended. Such actions tend to increase the possibility of personnel exposure or contamination due to accidental spills in transit. It is also possible that such actions could cause a loss of control over the sources. Under normal circumstances, the location of most sources will be known in advance and measures can be taken to deal with them. However, if an attempt is made to move sources, the attempt may not be successful and response personnel might not then be aware of their new location. This could pose a greater hazard than initially existed.

54.1.14. After the cleanup has been completed, a report of the incident will be prepared as directed by the WPAFB RSO and a copy submitted to the WPAFB RSC.

54.2. Radiation Fields. Accidents involving potential exposure to radiation fields are in general easier to deal with than spills although no less hazardous. The following procedures are recommended:

54.2.1. Shut down the source. For an x-ray unit this may involve interrupting the electrical supply either at the unit or at a main panel while for a radioisotope irradiator containing RAM it may be necessary to shield the source. In some cases it may not be possible to stop the radiation.

54.2.2. One individual should assume responsibility for immediate actions.

54.2.3. Warn others of the problem and send for assistance from the WPAFB RSO and others.

54.2.4. Isolate the area by closing doors or setting up improvised barriers to prevent entry. Be certain that no one is in the area before securing it.

54.2.5. After the situation has been corrected, a report of the incident will be prepared as directed by the WPAFB RSO.

## **55. Emergency Response Teams:**

55.1. The WPAFB RSO or a member of the staff will provide initial training and annual refresher training to all personnel who may be called on to respond to accidents/incidents involving RAMs or RPDs.

55.2. Supervisors will be responsible for informing the WPAFB RSO of newly assigned personnel to permit scheduling of initial training.

55.3. A listing of locations where RAMs or RPDs are stored or used, a summary of the sources located in each area and a copy of the site-specific emergency procedures provided by the organization possessing the sources will be made available to each emergency response team.

## ***Section N—Reporting Requirements***

**56. Mishaps, Incidents, and Accidents.** Any abnormal occurrence involving RAM or RPD shall be reported by the using organization to the WPAFB RSO immediately after the abnormal occurrence becomes known. Based on the severity of the occurrence, as specified in AFI 91-204 and AFI 40-201, the WPAFB RSO shall notify the following:

56.1. 88 ABW/CC/CA/SE.

56.2. HQ AFMOA/SGPR.

56.3. HQ USAF/SGOE.

56.4. HQ AFMC/SGPC/CE/JA/PA.

56.5. Other interested organizations with jurisdiction such as US Environmental Protection Agency, Food and Drug Administration or State of Ohio.

**57. Notice of Violation or Hazard:**

57.1. Any worker or representative of workers who believes that a violation of USNRC or USAF instructions or permit conditions has occurred, or that any defect in facilities or equipment exists which may pose a hazard to personnel or the environment shall report such conditions to:

57.1.1. The immediate supervisor, permit RSO, branch or division chief, or department chairperson.

57.1.2. The WPAFB RSO at extension 72010. In absence of the WPAFB RSO, reports may be made to the Chairperson of the WPAFB RSC at 75627.

57.2. Initial reports may be submitted verbally; however, a written report will be submitted within five workdays for proper documentation (AF Form 457, USAF Hazard Report, may be used). The willful failure to report such violations or hazards to personnel in accordance with procedures provided in this section may be considered a dereliction of duty and could result in disciplinary action.

57.3. Requests for inspection of violations or defects involving RAM possessed under authority of a USNRC license or USAF RAM permit, may be made to the Installation IG or directly, in writing, to the USAF RIC, USAF IG, or the USNRC Office of Inspection and Enforcement, Region III, according to 10CFR19.16(a). Addresses and telephone numbers for these organizations are presented in following table:

**Table 5. Organizational Addresses and Telephone Numbers.**

ORGANIZATION	ADDRESS	TELEPHONE	
		DSN	COMMERCIAL
USAF Radioisotope Committee	HQ AFMSA/SGPR 110 Luke Ave, Room 405 Bolling AFB, DC 20032-7054	297-4313 297-4011*	202-767-4313 202-767-4011
USAF Inspector General	HQ AFIA/SGO 9700 G Avenue, Suite 318D Kirtland AFB NM 87117	246-2610	(505) 846-2610
USNRC Region III (Inspection & Enforcement)	801 Warrenville Road Lisle IL 60532-4351	-----	(800) 522-3025

\*After duty hours (Bolling AFB Command Post)

*Section O—Radon.*

**58.** USEPA standards for exposure to radon are applicable to residential and non-residential structures on WPAFB. Newly constructed or acquired structures shall be assessed by the RSO for exposure to radon progeny, with the exception of hangars, maintenance bays, dedicated storage facilities, structures occupied less than four hours per day, temporary facilities and elevated structures with unobstructed air flow underneath. Tests shall be performed not earlier than one year after construction using long-term monitors. Structures identified with radon concentrations greater than 4.0 picocuries/liter shall be remediated by CE. Structures that have been mitigated shall be reassessed by the WP RSO within six months.

RONALD J. LESTER  
Director, Office of Environmental Management