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KIRTLAND AIR FORCE BASE

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KIRTLAND AIR FORCE BASE IONIZING RADIATION SAFETY PROGRAM

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This publication implements AF Instruction (AFI) 40-201, *Managing Radioactive Materials*, AFI 48-148, *Ionizing Radiation Protection*, and Air Force Manual (AFMAN) 48-125, *Personnel Ionizing Radiation Dosimetry*. This instruction applies to Department of Defense (DoD) personnel; including members of the Air Force Reserve and Air National Guard (ANG), United States Department of Energy (US DOE) prime contractors, and other civilian contractors who bring radioactive materials onto or use radioactive materials on Kirtland Air Force Base (KAFB). It sets forth how to acquire, receive, store, distribute, use, transfer, or dispose of radioactive materials and ionizing radiation producing devices. This instruction also prescribes how non-Air Force activities (associates) get approval to use radioactive materials on KAFB. Anyone subject to the Uniform Code of Military Justice (UCMJ) who violates these requirements and prohibitions is subject to punishment under UCMJ, Article 92, for failure to obey an order or regulation. Violations by civilian employees may result in administrative disciplinary action in addition to any criminal or civil sanctions that might result. The remainder of this instruction sets up guidance and criteria for performing military duties. It does not apply to radioactive materials transferred from the US DOE to the DoD as parts of nuclear weapon systems, certain radioactive parts of weapons systems, nuclear reactor parts and fuel controlled under Section 91b of the Atomic Energy Act (AEA), and DOE activities related to SAFE HAVEN requirements. This instruction complies with the Privacy Act of 1974. The authority to collect and keep the information required by this instruction is in 5 United States Code 552a (Public Law 93-579), DoD Directive 5400.11, *Department of Defense Privacy Program.* This publication may be supplemented at any level, but all supplements must be routed to the Office of Primary

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Chapter 1

THE KIRTLAND AIR FORCE BASE RADIATION SAFETY PROGRAM

1.1. Program Charter. Each person who works with or near radioactive materials or radiation producing devices could be exposed to ionizing radiation. This instruction addresses control of radioactive materials and identification of hazards associated with devices which produce ionizing radiation. In addition, this instruction describes the elements of the KAFB ionizing radiation safety program (RSP), which is designed to safeguard the health and safety of all affected individuals while at the same time accommodate the use of approved radiation sources and radiation producing devices to accomplish the mission objectives of the USAF. The effectiveness of the program depends not only on personnel responsible for organizing and implementing the program, but to a larger extent on the consistent and conscientious safety efforts practiced by individuals who work with or near sources of radioactive materials or devices which produce ionizing radiation.

1.2. ALARA Program. The RSP is designed to limit each individual's exposure to the minimal amount of ionizing radiation necessary in order to complete the organizational mission. Each individual will be trained before working in an area where exposure to ionizing radiation might occur. Each individual will be provided personal radiation dosimetry if it is probable that he or she might be exposed to ionizing radiation that exceeds the limit for mandatory radiation dosimetry outlined in AFMAN 48-125. Each source of radioactivity covered by a USAF permit will be tracked by the permit radiation safety officer (PRSO). Each source of radioactivity not covered by a USAF permit will be tracked by the applicable unit or by the installation radiation safety officer (IRSO). Under special circumstances the PRSO and IRSO may be the same individual. The PRSO and IRSO work together to establish, review, and implement programs and procedures to ensure that all individuals safely handle radioactive materials and ionizing radiation producing devices. The Bioenvironmental Engineering Flight (BEF) of the 377th Medical Group (MDG) is responsible for all workplace surveys and personnel radiation monitoring. Individual radiation exposures shall be tracked, work areas shall be surveyed, and the entire program shall be reviewed annually to ensure that the RSP maintains ionizing radiation exposures to individuals ALARA. (See Attachment 2 for details.)

1.3. Exemptions. The following are exempt from the conditions of this instruction.

1.3.1. On a case by case basis, naturally occurring radioactive materials (NORM) exempted from control by the PRSO, IRSO, or the Air Force Medical Support Agency (AFMSA), associate chief of Health Physics, USAF Radioisotope Committee (RIC).

1.3.2. Byproduct, source, and special nuclear material in quantities or concentrations not greater than those specified as exempt in applicable USAF instructions and technical orders, US Nuclear Regulatory Commission (US NRC), US Environmental Protection Agency (US EPA), and New Mexico State regulations, **whichever is most limiting.** Some federally exempted quantities, however, are regulated by the RIC.

1.3.3. Radioactive material included in paragraphs 1.3.1. and 1.3.2. shall not be exempted when used in combined quantities or any other manner such the at the personnel total effective dose equivalent (TEDE) to the whole body in unrestricted or restricted areas is likely to exceed the limits listed in AFMAN 48-125 or Title 10 Code of Federal Regulations

(CFR), *Energy*, Part 20, *Standards for Protection Against Radiation*, Subpart D and Appendix B, as applicable.

1.3.4. Electrical equipment like high voltage power units and Klystron tubes that are not primarily designed to produce ionizing radiation or used in that manner. The production, testing, servicing, and use of like equipment are not exempt if exposures to personnel exceed the limits listed in paragraph 1.3.3. and Chapter 7 of this instruction.

1.3.5. Exposures to individuals as part of medically approved patient diagnosis or treatment.

1.3.6. Unless otherwise specified by the IRSO, or RIC, exposures to individuals related to nuclear weapon systems, certain radioactive parts of weapons systems, nuclear reactor parts and fuel controlled under Section 91b of the AEA, and US DOE activities related to SAFE HAVEN requirements.

1.3.7. Exposures to individuals from other than DOD activities (e.g., US DOE), exposures from natural materials which have not been technologically enhanced (e.g., mineral deposits or biota), or exposures to nonionizing radiation (e.g., ultraviolet or infrared radiation).

Chapter 2

RESPONSIBILITIES

2.1. 377th Air Base Wing Commander (377 ABW/CC). The Commander has ultimate responsibility for the KAFB RSP. Duties can be fulfilled by the Vice Commander.

2.1.1. The vice commander, or a representative approved by the RIC, is generally designated by the USAF as the KAFB radioactive materials permit holder (permittee). The conditions of this part apply to the permittee and the 377 ABW/CC.

2.1.2. Coordinates with the PRSO, IRSO, BEF, and Major Command (MAJCOM) counterparts to accomplish requirements of AFI 40-201 and this instruction.

2.1.3. 377 ABW/CC appoints, in writing, a RIC approved PRSO, IRSO, and alternates to represent the 377 ABW on all issues pertaining to the use of radioactive material and ionizing radiation producing devices on KAFB.

2.1.4. Provides the PRSO and IRSO with the authority to temporarily suspend activities by personnel, units, associates, or contractors which create an imminent and dangerous threat to the environmental resources of KAFB or health and safety of personnel on the installation and/or covered by this instruction.

2.1.5. Reviews for approval new permit applications and permit renewals.

2.1.6. Provides the resources of the 377 ABW to the BEF to investigate accidents or incidents (e.g., thefts, losses, and spills) involving radioactive material and ionizing radiation producing devices that may have adverse effects on environmental resources and the health and safety of personnel covered by this instruction.

2.1.7. Works with group commanders to ensure that the PRSO, IRSO, and BEF possess resources necessary to conduct the work required by federal law, AFI 40-201, USAF permit conditions, and this instruction.

2.1.8. Enforces the requirements of the DOD, USAF, federal law, state law, local law, AFI 40-201, USAF permit conditions, and this instruction.

2.2. 377th Mission Support Group Commander (377 MSG/CC).

2.2.1. Advises the PRSO, IRSO, and 377 ABW/CC on issues which affect compliance with this instruction.

2.2.2. Coordinates with PRSO, IRSO, BEF, and MAJCOM counterparts to accomplish the requirements of AFI 40-201.

2.2.3. Consults with the PRSO, IRSO, and BEF on issues which involve radioactive materials or ionizing radiation producing devices. Such actions might include but are not limited to:

2.2.3.1. Review and modification of host-associate support agreements (SA) via the BEF.

2.2.3.2. Review and modification of emergency plans and procedures via the BEF.

2.3. 377th Medical Group Commander (377 MDG/CC).

2.3.1. Is responsible to the 377 ABW/CC for the initiation, supervision, and execution of the KAFB RSP.

2.3.2. With the advice of the PRSO, IRSO, and 377 ABW/CC, sets guidelines for the control of radioactive material, ionizing radiation producing devices, and protection of personnel health and safety.

2.3.3. Advises the PRSO, IRSO, and 377 ABW/CC on issues which affect compliance with this instruction.

2.3.4. Coordinates with PRSO, IRSO, BEF, and MAJCOM counterparts to accomplish the requirements of AFI 40-201.

2.3.5. Consults with the PRSO and IRSO on issues which involve radioactive materials or ionizing radiation producing devices. Such actions might include but are not limited to:

2.3.5.1. Review and modification of medical uses for radioactive materials or ionizing radiation producing devices via the BEF.

2.3.5.2. Review and modification of emergency plans and procedures via the BEF.

2.3.6. With the assistance of the BEF and oversight by the applicable PRSO or IRSO, provides the resources necessary to conduct physical examinations of individuals suspected of over-exposure to ionizing radiation in excess of the limits in AFMAN 48-125.

2.4. 377th Logistics Readiness Squadron Commander (377 LRS/CC).

2.4.1. Advises the PRSO, IRSO, and 377 ABW/CC on issues which affect compliance with this instruction.

2.4.2. Coordinates with PRSO, IRSO, BEF, and MAJCOM counterparts to accomplish the requirements of AFI 40-201.

2.4.3. Ensures that suppliers are made aware that radioactive materials and ionizing radiation producing devices will not be brought onto KAFB without the knowledge and approval of the applicable PRSO, IRSO and BEF.

2.4.4. Consults with the PRSO and IRSO on issues which involve radioactive materials or ionizing radiation producing devices. Such actions might include but are not limited to:

2.4.4.1. Review and modification of material and equipment requests through the Hazardous Materials Pharmacy or equivalent process via the BEF.

2.4.4.2. Review and modification of shipping procedures and documentation via the BEF.

2.5. 377th Base Civil Engineer (377 MSG/CE).

2.5.1. Advises the PRSO, IRSO, and 377 ABW/CC on issues which affect compliance with this instruction.

2.5.2. Coordinates with PRSO, IRSO, BEF, and MAJCOM counterparts to accomplish the requirements of AFI 40-201.

2.5.3. Makes provisions for the improvement and utilization of facilities needed to store radioactive materials, store radioactive waste resulting from remediation/restoration projects while pending disposal, and conduct health physics work.

2.5.4. Ensures that contractors are made aware that radioactive materials and ionizing radiation producing devices will not be brought onto KAFB without the knowledge and approval of the applicable PRSO, IRSO, or BEF.

2.5.5. Consults with the PRSO and IRSO on issues which involve radioactive materials or ionizing radiation producing devices. Such actions might include but are not limited to:

2.5.5.1. Review and modification of construction designs, plans, contracts, or contractor operations via the BEF.

2.5.5.2. Review and modification of disaster plans via the BEF.

2.6. Environmental Management Element Director (377 MSG/CEIE).

2.6.1. Advises the PRSO, IRSO, and 377 ABW/CC on issues which affect compliance with this instruction.

2.6.2. Coordinates with PRSO, IRSO, BEF, and MAJCOM counterparts to accomplish the requirements of AFI 40-201.

2.6.3. Obtains the funding and contracts necessary to ensure that environmental radiation compliance activities are accomplished in accordance with federal, USAF, and State regulations. This will be accomplished in accordance with the recommendations and input of the applicable PRSO, IRSO, or BEF.

2.6.4. Consults with the PRSO and IRSO on issues which involve radioactive materials or ionizing radiation producing devices. Such actions might include but are not limited to:

2.6.4.1. Review and modification of remediation designs or plans via the BEF.

2.6.4.2. Review and modification of sample analysis contracts and compliance planning via the BEF.

2.7. Squadron Commanders, Flight Commanders, and Supervisors.

2.7.1. Advise the PRSO, IRSO and respective group commanders on issues which affect compliance with this instruction.

2.7.2. Coordinate with subordinates those activities necessary to satisfy the requirements of AFI 40-201 and this instruction.

2.7.3. Consult with the PRSO and IRSO on issues which involve radioactive materials or ionizing radiation producing devices. Such actions might include but are not limited to:

2.7.3.1. Review and modification of worker safety programs and work practices via the BEF.

2.7.3.2. Review and modification of equipment and workplace operations via the BEF.

2.7.4. Ensure that personnel have appropriate radiation monitoring devices (i.e., pocket dosimeters and personnel dosimeter badges), protective clothing, and equipment for work in radiation areas.

2.7.5. Ensure that an inventory and procedures are maintained to account for and safely control radioactive materials and non-medical ionizing radiation producing devices. Unless otherwise specified, these shall be provided upon request to the applicable PRSO, IRSO, or BEF.

2.7.6. Ensure the use of ionizing radiation hazard warning tags, signs, and forms necessary to communicate ionizing radiation hazards.

2.7.7. Ensure that all personnel working with radioactive materials or in designated radiation areas have completed minimum training specified in Title 10 CFR Part 19, *Notices, Instructions and Reports to Workers: Inspection and Investigations.* Such training shall be specific enough to cover unique workplace hazards, the ALARA principle, and special precautions required of pregnant females.

2.7.8. Obtain written authorization through the applicable PRSO or IRSO to own, maintain, and use radioactive materials on KAFB. A general or specific license issued by the US NRC or an agreement state permit issued to an individual civilian or nonmilitary organization will not be valid on KAFB unless authorization is received from the applicable PRSO or IRSO.

2.7.9. Inform the applicable PRSO, IRSO, or BEF beforehand of any new systems, modifications, or repairs made to existing systems involving sources of ionizing radiation.

2.7.10. Provide in writing, to the applicable PRSO, IRSO, or BEF a detailed description of proposed ionizing radiation projects and, upon request, an oral presentation of the project. The proposal will address all potentially hazardous operations and conditions associated with the project, along with appropriate safety measures.

2.7.11. Obtain in advance from the applicable PRSO or IRSO a written approval on all procedures and subsequent revisions involving ionizing radiation sources. No operations involving the sources will be initiated before review and approval of procedures and instructions. Deviations from established procedures require the prior approval of the applicable PRSO or IRSO.

2.7.12. Notify in advance, the applicable PRSO, IRSO or BEF of the proposed movement of a radioactive material source on or off KAFB.

2.7.13. Appoint a Unit Radiation Safety Officer (URSO), who is knowledgeable in the duties involving ionizing radiation. Upon request, provide a copy of the letter of appointment to the applicable PRSO, IRSO, or BEF. The duties of the URSO are provided in paragraph 2.13 of this chapter.

2.8. Associates of KAFB. For the purpose of this instruction, an associate is an organization that utilizes resources provided by KAFB via the 377 ABW in order to sustain operations. This may be delineated by a support agreement. Associates are bound to comply with this instruction when their operations affect the environmental resources of KAFB or health and safety of personnel covered by this instruction.

2.8.1. Notify the IRSO or the BEF of plans to use radioactive materials or non-medical ionizing radiation producing devices on KAFB as soon as possible prior to start of operations. Support agreements (SA) or memorandums of understanding (MOU) may be created or modified with this information.

2.8.2. Unless otherwise specified in SAs or MOUs, associate units will be responsible for all costs associated with the 377 ABW support of their use of radioactive materials or non-medical ionizing radiation producing devices. These costs will include those associated with compliance with all DOD, USAF, DOE, state, tribal, and local regulatory requirements. In

addition, these costs will include those associated with training the applicable PRSO, IRSO, BEF and other KAFB personnel on operation specific emergency response techniques.

2.8.3. Notify the 377 MSG/CEIE and the IRSO of plans to use radioactive materials or non-medical ionizing radiation producing devices on KAFB as soon as possible prior to start of operations. As applicable, National Environmental Policy Act (NEPA) documents will be created or modified with this information. Notification will be made whenever changes to existing operations require an environmental assessment (EA) or environmental impact statement (EIS).

2.8.4. Provide the Emergency Management Office (377 MSG/CEMX) , PRSO, IRSO, and BEF with annual environmental surveillance reports.

2.8.5. Provide the 377 MSG/CEMX and applicable PRSO, IRSO, or BEF with timely notifications of radiation accidents or incidents which involve potentially harmful exposures of environmental resources or the health and safety of personnel covered by this instruction.

2.8.6. Inform the applicable PRSO, IRSO, or BEF in advance of shipments of radioactive materials covered by this instruction on to or off of KAFB.

2.9. Permit Radiation Safety Officer (PRSO). A military individual, usually with an Air Force specialty code (AFSC) of 43E3G (health physicist), or a civilian, who possesses the education and/or credentials required by AFI 40-201. The PRSO:

2.9.1. Whenever practical, will be a member of the BEF and have close interaction with the resources provided by the Commander, 377th Medical Group (377 MDG/CC).

2.9.2. Will be responsible for all managerial, health, and safety aspects associated with the RSP, as it pertains to a USAF radioactive materials permit issued by the RIC.

2.9.3. Will be responsible for all managerial, health, and safety aspects associated with the ionizing radiation safety work performed by the BEF.

2.9.4. Advises individuals, supervisors, flight chiefs, squadron or group commanders, and 377 ABW/CC on issues which affect compliance with this instruction.

2.9.5. Will execute those duties required by applicable Code of Federal Regulations, USAF instructions, USAF technical orders, HQ AFMSA surgeon general (SG) guidelines, HQ Air Force Global Strike Command surgeon general (HQ AFGSC/SG) policies, RIC instructions, USAF permits, 377 ABW guidelines and instructions, 377th Medical Group guidelines and instructions, and BEF guidelines and instructions or procedures. Specific functions will include but are not limited to:

2.9.5.1. Via the BEF implement and enforce actions approved by either the IRSO or 377 ABW/CC.

2.9.5.2. Conduct radiation and/or contamination surveys of work areas. Coordinate with the IRSO to utilize the resources of the 377 MSG/CEMX to conduct surveys of the environment. Surveys for other than USAF associates and contractors may be provided on a reimbursable basis via a MOU or SA.

2.9.5.3. Conduct radiation safety training of all individuals who work with radioactive materials and ionizing radiation producing devices. As deemed appropriate, provide

similar training to individuals who may be inadvertently exposed to radioactive materials or ionizing radiation producing devices.

2.9.5.4. Utilize the resources of the 377th Medical Group and BEF to provide radiation dose monitoring, via radiation dosimetry, to all individuals, areas, or emergencies covered by this instruction. This monitoring will be conducted in accordance with Title 10 CFR Part 20, AFMAN 48-125, and the AF Radiation Dosimetry Laboratory, Wright-Patterson AFB (USAFSAM/OEAS) instructions. Monitoring of other than USAF associates and contractors may be provided on a reimbursable basis via a MOU, SA, or at the discretion of the IRSO.

2.9.5.5. Review for approval all plans for proposed use of permitted radioactive materials or ionizing radiation producing devices.

2.9.5.6. Monitor and document permitted radioactive material receipts, transfers, or shipments. The IRSO must be notified of any of these actions, be involved throughout the process, and provided copies of any pertinent documentation for review and regulatory compliance.

2.9.5.7. Coordinate with the IRSO any storage of radioactive materials, radioactive waste disposal or transfer. Depending on the agency or organization, the costs of radioactive waste disposal may be at the generator's expense.

2.9.5.8. Coordinate with the IRSO to temporarily suspend activities by personnel, units, associates, or contractors which create an imminent and dangerous threat to the environmental resources of KAFB or health and safety of personnel covered by this instruction.

2.9.5.9. Work closely with the IRSO to satisfy the conditions of AFI 40-201 and this instruction.

2.9.5.10. Upon request, provide the IRSO any pertinent documentation associated with managing a USAF permit and the unit radiation protection program.

2.9.6. Will be the final authority for establishing the minimum requirements for the safe use of USAF permitted radioactive materials and ionizing radiation producing devices on KAFB.

2.10. Installation Radiation Safety Officer (IRSO). A military individual, usually with an AFSC of 43E3G (health physicist), or a civilian, who possesses the education and/or credentials required by AFI 40-201. Upon RIC approval, the 377 ABW/CC will, in writing, appoint the IRSO. The IRSO:

2.10.1. Whenever practical, will be a member of the BEF. This individual will have close interaction with the resources provided by the director 377 MSG/CEMX.

2.10.2. Will be responsible for all managerial, health, and safety aspects associated with the RSP, as it pertains to radioactive materials not otherwise covered by a USAF permit issued by the RIC. Will also be responsible for the same functions associated with ionizing radiation producing devices.

2.10.3. Will oversee all USAF permits issued by the RIC on KAFB to ensure full regulatory compliance.

2.10.4. Will be responsible for all managerial, health, and safety aspects (not otherwise covered by the PRSO or BEF) associated with the ionizing radiation safety work performed by personnel, units, associates, or contractors working on KAFB.

2.10.5. Coordinates with the PRSO to advise individuals, supervisors, flight chiefs, squadron or group commanders, and 377 ABW/CC on issues which affect compliance with this instruction.

2.10.6. Will execute those duties required by applicable Code of Federal Regulations; USAF instructions; USAF technical orders; HQ USAF/SG and civil engineer (CE) guidelines; HQ AFGSC/SG and CE guidance; and 377 ABW guidelines and instructions. Specific functions will include but are not limited to:

2.10.6.1. Coordinate and implement, with the PRSO, the actions approved by 377 ABW/CC.

2.10.6.2. Coordinate with the PRSO and BEF on environmental surveys. Surveys for other than USAF associates and contractors may be provided on a reimbursable basis via a MOU or SA.

2.10.6.3. Coordinate with the PRSO and BEF the utilization of resources, as needed, provided by the 377 ABW to conduct radiation safety training of all individuals who work with radioactive materials (not covered by a USAF permit) and ionizing radiation producing devices. As deemed appropriate, provide similar training to individuals who may be inadvertently exposed to radioactive materials or ionizing radiation producing devices.

2.10.6.4. Coordinate with the PRSO and BEF the review for approval all plans for proposed use of radioactive materials not covered by a USAF permit or ionizing radiation producing devices.

2.10.6.5. Via the BEF and the PRSO, monitor and document receipts, transfers, or shipments of radioactive material not covered by a USAF permit.

2.10.6.6. Coordinate with the PRSO and BEF the utilization of resources provided by the 377 ABW to store radioactive materials and waste until disposal or transfer, at the generator's expense, can be arranged. Coordinate with the 377 MSG/CEIE and BEF to store and manage mixed wastes until disposal or transfer, at the generator's expense, can be arranged. KAFB is not an authorized long-term radioactive waste accumulation location. All and any radioactive waste must be timely and properly disposed via coordination with the Air Force Radioactive Recycling and Disposal (AFRRAD) Office.

2.10.6.7. Coordinate with the PRSO to temporarily suspend activities by personnel, units, associates, or contractors which create an imminent and dangerous threat to the environmental resources of KAFB or health and safety of personnel covered by this instruction.

2.10.6.8. Work closely with the PRSO to satisfy the conditions of AFI 40-201 and this instruction.

2.11. Unit Radiation Safety Officer (URSO). The URSO will perform, at a minimum, the following duties:

2.11.1. Ensure that proper ionizing radiation hazard warning signs (to include labels and tags) are in good condition and posted in accordance with Chapter 5 of this instruction.

2.11.2. Ensure that all radioactive materials, to include generally licensed items and components that contain radioactive material, are ordered through the KAFB Hazardous Materials Pharmacy or equivalent process..

2.11.3. Ensure that all shipments and receipts of radioactive material, to include generally licensed items and components that contain radioactive material, are coordinated with the BEF and 377th Logistics Readiness Squadron's Senior Logistics Manager (377 LRS/LGL).

2.11.4. Ensure that personnel properly and routinely wear the personal radiation dosimetry issued by the BEF when working with radioactive material and ionizing radiation producing devices. Ensure that workers know how to request copies of their dosimetry results and confirm that they have personally reviewed their dosimetry results. Ensure that US NRC Form 3, *Notice to Employees* is posted in a conspicuous place when using radioactive materials permitted by the USAF.

2.11.5. Conduct periodic self-inspections of the unit's radiation safety program and provide the results to the applicable PRSO, IRSO, or BEF.

2.11.6. If radioactive waste is generated, make sure that it is timely disposed of in the proper manner as defined by the applicable PRSO, IRSO, or BEF.

2.11.7. Notify the applicable PRSO, IRSO, or BEF of any changes in the operation or use of radioactive materials or ionizing radiation producing devices.

2.11.8. Comply with AFI 40-201 and this instruction and maintain a copy of each in the work area for reference.

2.12. Individuals on KAFB. This pertains to anyone who is physically located within (to include contractors and associates not belonging to the USAF), for any reason, the confines of KAFB or areas for which the 377 ABW has jurisdiction. Individuals:

2.12.1. Will comply with requirements of the applicable Code of Federal Regulations, USAF instructions, USAF technical orders, HQ USAF/SG and CE policies, HQ AFGSC/SG and CE policies, RIC instructions, USAF permits, and 377 ABW guidelines and instructions. This includes compliance with guidance and instructions (verbal or written) set forth by the PRSO, IRSO, or 377 ABW/CC.

2.12.2. Will report through the chain of command or directly to the PRSO or IRSO, any evidence of individuals performing unsafe acts that appear to be an imminent and dangerous threat to the environmental resources of KAFB or the health and safety of personnel covered by this instruction. This includes reporting evidence of individuals performing acts in contravention to this instruction.

2.12.3. Radioactive material (to include technologically enhanced NORM) in the form of solids, powders, liquids, pastes, and gases shall not be placed on any individual's skin, clothing, bandages, or moulage to simulate radioactive contamination by more hazardous quantities and types of radionuclides.

Chapter 3

PERMITS AND APPROVALS

3.1. Radioactive Materials. Appropriate permits or licenses are required for possession or use of licensable quantities or concentrations of radioactive materials on KAFB. In some cases, reciprocal recognition of agreement state permits may need to be approved for possession or use of radioactive materials on KAFB (which is a federally regulated facility). This is accomplished via a US NRC Form 241, *Report of Proposed Activities in Non-Agreement States*, for US NRC license holders desiring to use byproduct radioactive material on KAFB. All source or special material (not 91B) outside NRC jurisdiction must receive pre-approval from the IRSO prior to transport to KAFB.

3.1.1. The IRSO must identify, review, and approve all licenses and reciprocal authorizations as part of the data submission required by the RSP for approval to use radioactive material on KAFB.

3.1.2. USAF authorizations and permits are also required for use of radioactive materials and ionizing radiation producing devices on KAFB.

3.2. Radiation Producing Devices. Copies of a device-specific radiation survey and operator/user manual must be provided to the applicable PRSO, IRSO, or BEF prior to use ionizing radiation producing machines on KAFB.

3.3. Jurisdiction. A USAF radioactive materials permit or US NRC license is required for use of licensable radioactive materials (byproduct or accelerator produced) on KAFB. The US DOE and its prime contractors are exempt when such material, or radiation producing devices, are used on US DOE property.

3.3.1. Unless specified by the USAF or the US Department of Transportation (US DOT), the US DOE, DoD, and their contractors are responsible for following Title 49 CFR, *Transportation Operations,* or a DOE recognized transportation equivalency for requirements governing the transporting radioactive material on to and off of KAFB.

3.3.2. Activities that involve the use of radioactive materials not designated in this chapter may be the responsibility of the New Mexico Environmental Department (NMED) or other federal, state, or local agency that issued the license or permit.

3.3.3. In cases where regulatory purview is in question, the 377 ABW/CC (with the advice of the installation judge advocate, and applicable PRSO, IRSO, or BEF) shall be the final authority for determining regulatory jurisdiction.

3.4. Use of Sources of Ionizing Radiation. A license, registration, or petition exemption issued by the US NRC or an agreement state to an individual citizen or nonmilitary organization is not valid on a USAF base unless USAF authorization has been obtained.

3.4.1. For contractors or users, who have permanent offices or facilities on KAFB, USAF authorization to use sources of licensable or permitted sources of ionizing radiation will be obtained from the RIC via the IRSO and PRSO.

3.4.2. For contractors or users, who have permanent offices or facilities on KAFB, USAF authorization to use sources of non-licensable or other than permit sources of ionizing radiation will be obtained via the IRSO.

3.4.2.1. An authorization letter is also required to transport radioactive materials covered by paragraph 3.3 onto KAFB. Requests shall be directed to the IRSO for approval to transport ionizing radiation sources onto KAFB.

3.4.2.2. IRSO review and approval is required for all written instruction or procedures (and subsequent revisions) applicable to operations using radioactive sources or ionizing radiation. This includes plans that involve the acquisition, storage, use, or transfer and disposal of such items. No operation or modification to existing systems will be initiated before review and approval of the required documents.

3.4.3. Submittals must be made as soon as possible, but in no case less than 30 days before intended approval of sources of ionizing radiation. If needed, the authorization may be issued on an annual basis so that it can be used multiple times. Contractors should list all sources that might be needed on site throughout the year, not just the sources for a one-time job, so they don't have to go repeatedly through the authorization process. The following information is required:

3.4.3.1. DOE organizations and DOE prime contractors must certify, in writing, that they are exempt from NRC licensing requirements (DOE and DOE prime contractors operating under 10 CFR 835, *Occupational Radiation Protection*.

3.4.3.2. Certify, in writing, that personal radiation dosimetry will be available and issued.

3.4.3.3. A copy of the most current NRC or Agreement State license with a current NRC form 241 for areas of exclusive Federal jurisdiction, if and when applicable (this does not applies to DOE and DOE prime contractors operating under 10 CFR 835).

3.4.3.4. The name, local address, and telephone number for the responsible representative and the name, address and telephone number of the organization's radiation safety officer.

3.4.3.5. A statement acknowledging that the KAFB IRSO, or a representative, may conduct periodic assessments to assure that they are complying with radiation safety practices to prevent exposures to personnel and avoid contamination of government property and that the KAFB IRSO can suspend any operations believed to be unsafe.

3.4.3.6. List of all sources (radionuclide, physical form, activity, activity calibration date).

3.4.3.7. Details on how and where they plan to use the radioactive sources while on KAFB including specific operating and emergency procedures. Include the approximate dates of arrival and departure of radioactive materials and proposed mode of transportation to be used. A description and specifications of packaging and any added containment or shielding used. For work involving remediation, a copy of a health and safety plan (HaSP) per Title 29 CFR, *Labor,* Part 1910.120 requirements is required.

3.4.3.8. Indicate if the sources will remain on KAFB for a period of days and if so, provide the temporary source storage location and source security protocols.

3.4.3.9. Most recent leak tests results for all sealed sources.

3.4.3.10. Documentation of radiation safety training for all personnel authorized to handle the source(s).

3.4.3.11. Certify, in writing, that the contractor will comply with the requirements in 49 CFR when transporting radioactive materials within KAFB.

3.4.3.12. Upon termination of the contracted work activities, certify, in writing, that all radioactive material(s) and radioactive waste (if any) were removed from KAFB.

3.4.4. In addition to the requirements listed above, any contractor or organization seeking approval to use radioactive sources at KAFB for radiological training/exercises must submit a copy of the approval letter issued by the IRSO and an AF Form 813, *Request for Environmental Impact Analysis*, to the KAFB Technical Advisory Subcommittee (377 MSG/CEIE) for final approval.

3.4.5. The following additional requirements must be met whenever the authorization request involves radiological training/exercise with radioactive material(s) in liquid form:

3.4.5.1. Radioactive material(s) in liquid form shall not have a radiological half-life greater than six hours.

3.4.5.2. Radioactive material(s) in liquid form shall not be dispersed over or injected into humans, animals, or foodstuffs.

3.4.5.3. Radioactive material(s) in liquid form shall not be dispersed over soil or vegetation.

3.4.5.4. Provide a description of contamination control procedures and other precautions that will be in place to prevent the spread of contamination.

3.4.5.5. Radioactive material(s) in liquid form will only be dispersed on horizontal surfaces and on top of leak-proof absorbent paper.

3.4.5.6. Submit pre-training and post-training radiological contamination surveys of all locations where radioactive material in liquid form was dispersed on.

3.4.5.7. Submit a disposal plan for any radioactive waste generated. KAFB will not collect or allow the accumulation of any radioactive waste to remain within the boundaries of the installation.

3.4.5.8. Upon termination of the radiological training/exercise activities, certify, in writing, that all radioactive material(s) and radioactive waste (if any) were removed from KAFB.

3.5. Failure to Comply. If any radioactive material or ionizing radiation producing device is improperly or illegally transported on to KAFB, such items will be subject to operational impoundment until the irregularities are corrected and official approval obtained. In addition, such items may be immediately removed from KAFB and impounded with federal, state, or local authorities.

3.6. Coordination Focal Point. The IRSO is the focal point for approval and coordination of procedures and items applicable to the RSP, this chapter, and this instruction.

Chapter 4

PROCEDURES AND REQUIREMENTS FOR THE CONTROL OF SOURCES OF IONIZING RADIATION--PERSONNEL PROTECTION GUIDELINES

4.1. Personnel Radiation Exposure Control. In general, radiation exposure to personnel on KAFB shall be monitored and will be maintained at levels ALARA. Operations shall adhere to the basic ALARA principles of time limitation, use of shielding, and increasing distances between ionizing radiation sources and personnel. No procedures, except approved medical procedures, shall be performed that would purposely involve internal uptake of radionuclides (e.g., ingestion, inhalation, and skin absorption). Operations that have the potential for internal uptake of radioactive materials shall include the use of protective equipment or other control measures as approved by the applicable PRSO, IRSO, or BEF.

4.1.1. Unless specifically directed by the DoD or USAF, nothing in DoD, USAF, federal, state, or local regulations shall preclude KAFB from keeping ionizing radiation exposure to personnel ALARA. Only the 377 ABW/CC, or applicable PRSO or IRSO has the authority to temporarily deviate a program which espouses the KAFB ALARA program.

4.1.2. Personnel monitoring programs are required by DoD, USAF, federal, and state regulations for personnel exposures to ionizing radiation. For licensed radioactive materials or ionizing radiation producing devices, criteria and limits are set by the regulating agencies. The personnel radiation dosimetry program at KAFB (Dosimetry Program) is managed by the BEF under direction of the IRSO.

4.1.3. Unless otherwise specified by the IRSO, all new personnel assigned to duties in work areas using specific types and quantities of radioactive materials will require dosimetry. Unless otherwise specified by the IRSO, all new personnel assigned to duties in work areas using ionizing radiation producing devices will require dosimetry. Contractors and associates may be required to provide their own dosimetry however; it will be mandatory unless otherwise specified by the IRSO.

4.1.4. All individuals **likely** to receive a TEDE exposure to the whole body from ionizing radiation of 100 milli-radiation equivalent man (mrem) in one year, as part of their occupation, will be placed on the BEF Dosimetry Program and given a radiation dosimeter. Supervisors will request radiation dosimeters for these individuals from the BEF. When individuals are removed from ionizing radiation work areas, the supervisor shall request of the BEF that those individuals be removed from the Dosimetry Program. The supervisor cannot terminate dosimetry without the approval of the IRSO. New personnel shall provide the BEF with information about previous employment that involved exposures to ionizing radiation. In addition, new personnel shall provide the BEF with information about additional employment (i.e., moonlighting), which requires them to wear a radiation dosimeter.

4.1.5. Under no circumstance will an individual’s cumulative USAF and moonlighting occupational dose be permitted to exceed the limits established by AFMAN 48-125. If there is a potential that the cumulative USAF and moonlighting occupational dose can exceed the limits noted in AFMAN 48-125, the commander of that individual shall ensure that all moonlighting privileges (which cause the radiation exposure) be revoked.

4.1.6. All members of the public, entering areas which are restricted (in whole or in part) for the purpose of controlling radiation exposures, shall be placed on the BEF Dosimetry Program when exposure rates in those areas are likely to exceed 2 mrem (milli-radiation equivalent man) in one hour or the cumulative TEDE whole body dose of the member of the public is likely to exceed 100 mrem in one year.

4.1.7. The IRSO reserves the right to enroll personnel in the Dosimetry Program to demonstrate ionizing radiation exposures remain ALARA. This may entail placing personnel on the Dosimetry Program even when the limits of paragraphs 4.1.4, 4.1.5, and 4.1.6. are not likely to be exceeded.

4.1.7.1. During potentially hazardous operations, the PRSO or IRSO may require that an individual wear two radiation dosimeters.

4.1.7.2. The whole body beta or gamma dosimeter shall be worn on the outside of garments on the front side of the body. It will be worn underneath a lead apron that is used for shielding (e.g., fluoroscopy or medical radiography). The beta window of the dosimeter shall be pointed away from the body (i.e., the name tag will be towards the body).

4.1.7.3. Separate neutron whole-body dosimeter will be worn on the belt, near the center of the body. Neutron badge response is partially dependent on albedo (thermal neutron backscattering) effects and wearing the badge on the chest of the body could provide an undesirable under-response.

4.1.7.4. Individuals who are issued Thermoluminescent Dosimeters (TLD) or other dosimeters will not tamper with these devices. Purposefully using a personnel dosimeter in a way as to create an artificial dose may result in disciplinary action. The commander of any individual found guilty of this offense will issue the appropriate disciplinary action recommended by the UCMJ.

4.1.7.5. Dosimeters should not be exposed to temperature extremes, excessive shock, or excessive moisture. Dosimeters that are accidentally damaged or exposed, shall be returned to the BEF immediately. A new one will be provided. A report on the nature of the incident or accident may be required by the PRSO or BEF.

4.1.7.6. Dosimeters shall be kept on the control board in an area approved by the PRSO (low background ionizing radiation area) when not in use. The approved location need not be documented in writing. The control dosimeter shall remain on the control board at all times. This dosimeter quantifies ambient (background) radiation. The control dosimeter shall not be worn by any individual.

4.1.7.7. Visitors are required to register with the supervisor before entry into work areas where radiation exposures could exceed paragraph 4.1.7. Before the visitor enters a restricted radiation work area, the supervisor shall check with the PRSO or IRSO to determine if radiation dosimetry is required. If radiation exposures to the visitor could exceed the whole body dose limit as per AFMAN 48-125, the supervisor will issue radiation dosimetry to the visitor and keep a visitors' log. The log will contain the visitor's name, address, date, time in and out, type of dosimeter, dosimeter number, and the initial and final dosimeter readings. On the request of the supervisor, the PRSO or

IRSO will issue a written standing order, which prescribes the type of dosimeter authorized for use by visitors.

4.2. Personnel Contamination Control. All individuals working with sealed and unsealed sources of radioactive material covered by this instruction (not exempt) shall adhere to the following rules.

4.2.1. Wear latex gloves (or equivalent) and personal protective equipment (PPE) when working with unsealed radioactive materials or sealed radioactive materials suspected of leaking.

4.2.2. Periodically monitor hands, PPE, and clothes with a properly calibrated ionizing radiation survey meter capable of detecting the primary energies of the potential contaminate when working with unsealed radioactive materials or sealed radioactive materials suspected of leaking.

4.2.3. Leave PPE (e.g., laboratory coats) in work areas.

4.2.4. Monitor gloves with a survey meter (referenced in paragraph 4.2.2.) before removing them from hands. If survey results indicate a count rate or exposure rate less than twice background, they may be discarded as solid waste.

4.2.5. Wash hands thoroughly before eating, drinking, smoking, or leaving work.

4.2.6. Use properly calibrated survey instruments and swipe samples to determine the effectiveness of decontamination procedures.

4.2.7. Use mechanical pipettes for transfer of small quantities of potentially radioactive liquids. Never pipette by mouth.

4.2.8. Smoking, applying cosmetics, drinking, eating (to include chewing gum), or preparing food in work areas where radioactive materials are handled or stored is prohibited.

4.2.9. In case of an accident or incident involving radioactive material, avoid excessive exposure, contain the contamination, perform personnel decontamination (if necessary), and notify the area supervisor and the applicable PRSO, IRSO, or BEF as soon as possible.

4.2.10. Never decontaminate equipment, clothing, or personnel suspected of radioactive contamination with a hazardous material (i.e., solvent) listed in Title 10 CFR Part 40, *Domestic Licensing of Source Material.* This may create a mixed waste.

4.2.11. Avoid using unsealed radioactive material or sealed radioactive material suspected of leaking around equipment or clothing that contain hazardous substances (i.e., solvents, heavy metals, and asbestos fibers). This may create a mixed waste.

4.2.12. Never discard potentially radioactive materials or waste without first assessing its radioactivity.

4.2.13. Never empty potentially radioactive materials (“hot” materials) into sinks or waste containers that are not approved as such by the applicable PRSO, IRSO, or BEF.

4.2.14. Avoid adjusting clothing or personal effects (e.g., rolling up sleeves or brushing back hair) while working with unsealed radioactive materials or sealed radioactive materials suspected of leaking.

4.2.15. Avoid handling clean equipment while wearing potentially contaminated gloves.

4.2.16. Do not remove radiation hazard warning labels or tags without the approval of the applicable URSO, PRSO, or IRSO. After such approval is received, ensure that all radiation hazard warning symbols and words are completely removed from tags or labels before placing them in the trash.

4.2.17. Use tools that are known to be uncontaminated, unless prior approval to use contaminated tools has been granted by the applicable PRSO or IRSO.

4.2.18. Place a protective covering on the work surface where unsealed radioactive materials or sealed radioactive materials suspected of leaking may be used.

4.2.19. Do not leave radioactive materials on top of unattended laboratory benches unless the area can be secured from unauthorized personnel and non-radiation workers.

4.2.20. Label all potential radioactive materials or waste with radiation hazard warning tags or labels. The tag or label must note the radionuclide, activity (if known), the date, and name of responsible individual. If the radioactive source is too small, attach a tag or label with the same information onto the container in which it is stored. In addition, place a radiation hazard warning tag or label in the container.

4.2.21. Immediately report any exposure in excess of 100 mrem, as shown on direct reading dosimeters or surface monitoring equipment, to the supervisor, URSO, PRSO, or IRSO.

4.2.22. Consult with the applicable PRSO, IRSO, or BEF for advice on what type of PPE should be used for operations involving potentially hazardous levels of radioactive contamination. Precautions must be observed in the handling of potentially contaminated clothing to prevent release or cross-contamination.

4.2.23. Contamination limits for all PPE and equipment are listed in Attachment 4 of this instruction or the removable contamination limits in AFI 48-148.

4.2.24. PPE or clothing with a fixed alpha contamination less than 200 disintegrations per minute (dpm) per 100 square centimeters (cm^2) (200 dpm/100 cm^2) may be sent to USAF approved laundry facilities. PPE or clothing released to conventional laundries shall have no removable contamination as determined by a swipe test and physical survey with an appropriate ionizing radiation survey instrument. PPE or clothing contaminated above the allowable limits with short-lived radionuclides (i.e., less than 120 day half-life) will be stored for no less than 10 half-lives and until the contamination is not detectable above background levels to permit decay of the radionuclides to a safe level before laundering. PPE or clothing contaminated above the allowable limits with long-lived radionuclides will be treated as radioactive waste or sent to a company equipped and licensed to launder such clothing. Persons wearing potentially contaminated PPE or clothing will not be permitted to enter clean areas. No attempts should be made by individuals to personally launder PPE or clothing potentially contaminated with radioactive material.

Chapter 5

RADIOLOGICAL HEALTH PROTECTION GUIDELINES

5.1. KAFB Users of Ionizing Radiation Sources. All users will comply with the following requirements and guidelines in support of the RSP.

5.1.1. Radioactive material, when not in use, shall be secured at all times against unauthorized access. Radioactive material shall never be left unattended.

5.1.2. Personnel who enter an area restricted for the purpose of ionizing radiation protection shall wear a dosimeter.

5.1.3. PPE must be donned before entering an area restricted for the purpose of limiting radioactive material contamination.

5.1.4. Radiation areas, as defined in paragraph 5.9., will be posted and controlled by the user at all times.

5.1.5. The appointed radioactive material custodian, operator of ionizing radiation producing device, and the URSO must be familiar with the provisions of this instruction.

5.1.6. Unit radiation safety programs, that control radiological hazards on KAFB, must conform to the minimum standards described in this instruction and any additional requirements imposed by the 377 ABW/CC, applicable PRSO, IRSO, or BEF.

5.1.6.1. Report to the BEF, damage to or malfunction of equipment or exhaust systems when these systems are required by approved operational procedures.

5.1.6.2. Report to the applicable PRSO, IRSO, or BEF dosimeter readings (in excess of 125 mrem), damage to or loss of a personnel monitoring devices, or possible accidental overexposure to radiation. Overexposure is defined as an exposure in excess of the occupational annual dose limit).

5.1.6.3. Report to the applicable PRSO, IRSO, or BEF any loss, spill, theft, or unintentional release of radioactive material.

5.1.6.4. Report to the BEF and to Public Health Flight (PHF) wounds resulting in a break in the skin or other incidents where radioactive material may have entered a person's body.

5.1.6.5. Report to the applicable PRSO, IRSO, or BEF fires, disasters, or any other emergency situations in close proximity to where radioactive material is stored or used.

5.1.6.6. Report to the applicable PRSO, IRSO, or BEF possible overexposures to non-radiation workers (i.e., general public and minors).

5.1.6.7. Report to the applicable PRSO, IRSO, or BEF the inability to return a radioactive source to the shielded position, whether real or suspected.

5.1.7. Supervisors of users will ensure that individuals working in areas controlled, for the purposes of radiation protection, perform their assigned tasks according to approved operating procedures and applicable rules, instructions, and health physics requirements.

5.1.8. Users will clean up any radioactive contamination resulting from their operations, under the direction of the applicable PRSO, IRSO, or BEF.

5.2. Procurement of Radioactive Material.

5.2.1. Because of the inherent hazard of radioactive materials, restrictions are placed on the issue and procurement of radioactive materials, components containing radioactive materials, or articles and instruments containing radionuclides to KAFB activities.

5.2.2. All requests for items listed in paragraph 5.2.1. will be processed through the KAFB Hazardous Materials Pharmacy or equivalent process. Unless otherwise specified by the applicable PRSO or IRSO, no individual, unit, organization, associate, or contractor on KAFB is permitted to order or receive directly from the manufacturer (or owner) items listed in paragraph 5.2.1.

5.2.3. Entities listed in paragraph 5.2.2. shall seek the advice of the applicable PRSO or IRSO on items listed in paragraph 5.2.1. that they desire to obtain. The authorizations of USAF permits and US NRC licenses will be followed in this regard.

5.2.4. The Hazardous Materials Pharmacy or equivalent process shall submit all requests for the procurement of licensable (or USAF permitted) quantities of radioactive material to the PRSO. The Hazardous Materials Pharmacy or equivalent process shall submit all requests for the procurement of non-licensable (or other than USAF permitted) quantities of radioactive material to the IRSO or BEF. The Hazardous Materials Pharmacy or equivalent process shall assign the hazard exception code of "T" to all requests for items listed in paragraph 5.2.1.

5.2.5. Applications for radionuclides that exceed current (USAF radioactive material permit) possession limits will require the submission of a permit amendment application to the RIC by the PRSO prior to receiving the proposed additional material. This does not, however, prohibit the requester or applicant from filing an invitation for bid (IFB) through the KAFB Contract Manager, provided that the requester or applicant states on the IFB that the USAF cannot receive the radioactive material until an approved permit amendment has been received from the RIC.

5.3. Radioactive Material Transfer Procedures.

5.3.1. Personnel responsible for permitted radioactive material may not transfer that material to anyone, except as provided in the USAF radioactive material permit. The PRSO or BEF shall be contacted to coordinate a transfer.

5.3.2. Personnel responsible for radioactive material (not permitted) may not transfer that material or devices to anyone, except as directed by the applicable IRSO or BEF. The IRSO or BEF shall be contacted when assistance is needed to coordinate a transfer.

5.3.3. Requests for transfer will include the names of persons from whom and to whom the radionuclide is to be transferred, radionuclide, activity in Becquerel and in Curies, locations involved, chemical and physical form, and dates of intended transfer. All transfers will be from person to person, not from person to location. Before transfer, verification of authorization of the receiving individual must be completed. Each transfer will require a receipt that will be signed only by the person for whom the radioactive material is intended. Do not exceed quantities requested. Transport shall be conducted in adequately shielded and

closed containers. Containers will be so constructed that release of the radioactive material is unlikely under normal conditions of transport. If the isotope is a liquid or powder, place it in polyethylene bottles (or some other break-proof container). Radioactive materials should not be carried by hand when they can be transported by vehicle or laboratory cart. Containers in transit must bear the appropriate radiation hazard warning tag or label. The warning tag or label must contain information on the name of the radionuclide, physical form, chemical form, activity in Becquerel and in Curies, dose-rate, in mrem/hr (milli-radiation equivalent to man per hour) at the outer surface of container, and maximum dose rate (in mrem/hr) at a distance of 1 meter from the outer surface of the container.

5.4. Off Base Transport of Radioactive Material.

5.4.1. Coordinate the transport of any radioactive materials covered by this instruction off of KAFB with the applicable PRSO, IRSO, or BEF.

5.4.2. Transport of radioactive materials listed in paragraph 5.4.1. will be in accordance with 49 CFR and only to individuals or organizations authorized to receive and possess them.

5.4.3. An official notification of receipt shall be obtained by the applicable PRSO, IRSO, or BEF.

5.5. Receipt. All radioactive materials received on KAFB will be handled in the following manner.

5.5.1. Only the 377th Logistics Readiness Squadron's Supply Division Inspection Section (377 LRS/LGRQ) is permitted to receive items listed in paragraph 5.2.1.

5.5.2. When radioactive materials are received, the BEF will be contacted. Surveys of packages containing radioactive materials will follow Title 10 CFR Part 20 requirements. Leak testing of sources will follow the applicable permit conditions and AFI 40-201.

5.5.3. The 377 LRS/LGRQ will notify the intended recipient of the radioactive materials after all BEF surveys, leak test, and inventories have been completed.

5.5.4. The material will be transported directly to the intended recipient. If the intended recipient cannot be located, the radioactive material will be stored in a BEF designated radioactive materials storage area until it can be accepted.

5.5.5. For radioactive materials covered by a USAF permit, the PRSO will add it to the permit radioactive materials inventory. For radioactive materials not covered by a USAF permit, the workplace case-file and the URSO, in coordination with the IRSO, will add it to a local inventory.

5.6. Storage.

5.6.1. Users of radioactive materials shall store them in a safe and secure location, which affords the proper shielding to members of the public. Devices that can produce ionizing radiation shall be designated or modified to preclude inadvertent operation while not in use.

5.6.2. Areas designated for the storage of radioactive material shall conform to the following minimum standards.

5.6.2.1. At a minimum, radioactive materials shall be stored such that the exposure rate outside the restricted area does not exceed 2 mrad/hr (milli-radiation absorbed dose per

hour). Whenever possible, radioactive materials shall be stored such that the exposure rate in offices next to restricted areas does not exceed 50 rad/hr (micro-radiation absorbed dose per house).

5.6.2.2. Secure areas restricted for the purpose a limiting radiation exposures against unauthorized entry.

5.6.2.3. With the advice of the applicable PRSO, IRSO, or BEF, post (in sufficient number) appropriate radiation hazard warning signs. Consider posting bilingual (English and Spanish) radiation hazard warning signs.

5.6.2.4. Ensure that radioactive material use and ionizing radiation producing device use areas are free from conventional safety hazards.

5.6.2.5. Post the names and telephone numbers of the source or device custodian, URSO, applicable PRSO, IRSO, or BEF representatives in a conspicuous location. Post in the same location, other emergency telephone numbers as required by KAFB instructions.

5.6.2.6. At least one fire resistant (no asbestos) container shall be used to store all of the radioactive material.

5.6.2.7. Ensure that sufficient (and operational) fire-suppression devices and equipment are readily available to the area.

5.6.3. Place empty shipping and storage containers in a designated storage area. Ensure that the word "EMPTY" is on the container.

5.6.4. Areas containing large amounts of radioactive material may be subject to additional requirements, such as separate ventilation systems (floor detains, etc.). The applicable PRSO, IRSO, or BEF representative will assist in determining additional requirements.

5.6.5. The applicable PRSO, IRSO, or BEF representative will at least annually advise fire response units and security police of the hazards and locations of radioactive material storage areas.

5.6.6. The PRSO, IRSO, or the BEF will conduct a quarterly (or at time intervals per USAF permit conditions) contamination and exposure rate survey of each area in which radioactive material is stored. The frequency of this survey may be increased under the direction of the applicable PRSO, IRSO, or BEF.

5.6.7. Keep contaminated equipment, PPE, waste, and supplies in designated storage areas. Never store such items in laboratories or return item to the stock room.

5.6.8. The IRSO, or the BEF will conduct a contamination and exposure rate survey when radioactive material is permanently removed. The storage area must have a written clearance from the IRSO, or BEF before it can be used for other purposes.

5.6.9. The applicable PRSO or IRSO is the only individual authorized to approve deviations from the instructions provided in this chapter.

5.7. Waste Disposal. Radioactive wastes appear in a large variety of forms, depending upon the particular use of the radionuclide. In general, radioactive wastes include expended components and contaminated substances (e.g., solid, liquid, and gas).

5.7.1. As much as practical, separate containers shall be used to accumulate "like" radioactive waste. A separate container shall be used to accumulate wastes with radionuclide possessing half-lives less than and greater than 120 days (i.e., never mix short and long half-life waste). As much as practical, liquids, gases, and solids should be accumulated in separate containers.

5.7.2. Collection, segregation, and handling of radioactive wastes will be performed by the personnel in the area in which the waste originated. The area supervisor shall keep records of the type of radioactive material in each waste container, the estimated activity, the date of the estimation, the exposure rate (in mrem/hr) at the surface of the container, the exposure rate (in mrem/hr) at 3 feet from the surface of the container, the survey instrument used to measure the exposure rate, and calibration date of instrument. Mark containers of radioactive waste with a sufficient number of appropriate radiation hazard warning labels or tags. The tag or label shall contain sufficient information to identify the contents of the container.

5.7.3. Containers for liquid wastes will consist of glass or polyethylene bottles. When glass bottles are used, they must be positioned in a container where all the contents of the bottle will be retained should the bottle be broken. Polyethylene bottles are preferred because of their unbreakable quality. Bottle waste containers shall possess caps that will not leak or come loose when the containers are tipped on their sides.

5.7.4. Containers for solid wastes will consist of 55-gallon steel drums, 35-gallon garbage cans, foot operated lid waste cans, or wooden boxes. These containers (except 55-gallon drums) must be lined with heavy gauge plastic bags that extend over the top edge of the containers. For most laboratories, the foot-operated lid waste can is sufficient. When the container is 80 percent filled, tie the plastic bag shut. Remove the bag from the container, monitor, and then dispose of it in the manner indicated by this instruction. Wrap sharp objects (such as broken glass and needles) in puncture resistant coverings before placing them in plastic bags. Bags with sharp objects will not be processed until sharp objects are separated and correctly bagged for disposal.

5.7.5. All radioactive waste that has been placed in storage will be reviewed by the applicable PRSO, IRSO, or BEF on an annual basis. The review will include, but is not limited to, assessment of any short-lived radioactive material being decayed in storage, condition of the containers, and the condition of the storage facility. The applicable PRSO, IRSO, or BEF will determine when the AFRRAD Office shall be notified about packaging, pick-up, shipment, and disposal of the waste. The conditions of any US NRC requirements, USAF permits and AFI 40-201 shall be followed when considering when and how to dispose of radioactive waste.

5.7.6. No waste material may be disposed of or moved from KAFB by anyone without prior approval of the applicable PRSO, IRSO, or BEF.

5.7.7. The NMED does not permit the disposal of specific radioactive components and waste in accordance with any USAF guidance documents. Consult with the applicable PRSO, IRSO, or BEF for specific guidance in this regard.

5.8. Transportation of Radioactive Materials.

5.8.1. Transport of radioactive materials exclusively on KAFB is authorized after receiving approval from the applicable PRSO, IRSO, or BEF.

5.8.2. Notify the applicable PRSO, IRSO, or BEF at least two hours before scheduled movement of any radioactive material on KAFB.

5.8.3. Unless specified by the applicable PRSO or IRSO, only 377 LRS/LGL is authorized to ship radioactive materials to entities not located on KAFB. Anyone approved by the applicable PRSO, IRSO, or BEF to transport radioactive materials off of KAFB must package and transport such in accordance with the applicable sections in the following relevant publications.

5.8.3.1. Title 49 CFR Parts 171 through 199, applicable to packaging and shipment by rail, highway, air, or water transport.

5.8.3.2. Title 10 CFR, Part 71, *Packaging and Transportation of Radioactive Material,* for certain shipments of missiles and large quantities of US NRC licensed materials.

5.8.3.3. Title 39 CFR, *Postal Services,* Parts 124 and 125, for shipments of radioactive material by United States Postal facilities.

5.8.3.4. Title 46 CFR, *Shipping,* Parts 146 and 149 for shipments by water transport.

5.8.3.5. AFI 40-201 and the applicable portions of Air Force Joint Manual (AFMAN) 24-204, *Preparing Hazardous Materials for Military Air Shipments.*

5.8.4. Get assistance and instructions on proper packaging and shipment of radioactive materials from the BEF.

5.8.5. Units should coordinate transportation of radioactive material from KAFB through the BEF before sending it to Transportation Management Office (TMO). The BEF will sign the appropriate shipping documents indicating that the radioactive materials package has been checked and meets all requirements. TMO shall not ship any radioactive material without prior approval of the BEF.

5.8.6. Transportation of radioactive material in excess of generally licensed quantities in privately owned (including leased) automobiles and commercial passenger-carrying vehicles (e.g., taxis, buses) is prohibited.

5.8.7. Transportation of radioactive materials, other than those used for medical applications, on commercial aircraft used for passenger travel is prohibited.

5.8.8. Shipment of radioactive materials through the US Postal Service (regular mail) is prohibited.

5.8.9. Whenever practical, packages containing radioactive material shall be shipped "Cargo Aircraft Only."

5.8.10. Immediately report suspected loss or theft of radioactive materials to the applicable PRSO, IRSO, or BEF.

5.8.11. Unless specified by the applicable PRSO or IRSO, only the 377 LRS/LGRQ is authorized to receive packages containing radioactive material from entities not located on KAFB.

5.9. Radiation Area Identification and Access.

5.9.1. **Posting of Radiation Areas.**

5.9.1.1. If required by local operating procedures, post control instructions conspicuously at the entrances to all areas restricted for the purpose of limiting radiation exposures to personnel. This instruction will provide an up-to-date notification of the working restrictions in that area. Persons entering a restricted area will be informed, as required by area operations plans, on permitted occupancy times, contamination control techniques, PPE needs, and personnel dosimetry.

5.9.1.2. Restricted areas shall be posted with radiation hazard warning signs, tags, labels, barriers, notices, and instructions required by Title 10 CFR Parts 19 and 20, AFI 40-201, and this instruction. A sufficient number of radiation hazard warnings will be posted on all restricted area entrances to fully communicate the hazards of the restricted area before an individual inadvertently or intentionally makes entry. Particular emphasis must be made to post access routes into the following areas:

5.9.1.2.1. **Airborne Radioactivity Area.** An airborne radioactivity area is an area in which airborne radioactivity is present in concentrations that are likely to exceed the derived air concentration limits specified in Title 10 CFR Part 20, Appendix B or an area in which an individual without respiratory protection could receive in a week an intake of 0.6 percent of the annual limit on intake (12 derived air concentration (DAC) hours). Such an area shall be posted with **magenta and yellow** signs bearing a radiation symbol and the words "CAUTION--AIRBORNE RADIOACTIVITY AREA."

5.9.1.2.2. **Radioactively Contaminated Area or Item.** An area or item that is potentially contaminated with radioactive material is any area or item where removable or fixed radioactive contamination levels exceed those listed in Attachment 4 of this instruction. Those areas or items shall be posted with the appropriate radioactive contamination hazard warning signs, tags, or labels indicating "CAUTION -- RADIOACTIVE CONTAMINATION."

5.9.1.2.3. **High Radiation Area.** A high radiation area is any area accessible to personnel in which there exists ionizing radiation at such levels that a major portion of the body may receive in 1 hour a dose in excess of 100 mrem at a distance of 30 centimeters from any radioactive source. Such an area shall be posted with **magenta and yellow** signs bearing a radiation symbol and the words "CAUTION--HIGH RADIATION AREA."

5.9.1.2.4. **Radiation Area**. A radiation area is any area accessible to personnel with a radiation level such that a major portion of the body could receive in 1 hour a dose in excess of 5 mrem at a distance of 30 centimeters from any radioactive source. Such an area shall be posted with **magenta and yellow** signs bearing a radiation symbol and the words "CAUTION--RADIATION AREA."

5.9.1.2.5. Radioactive Material Storage Areas and Containers. Post areas and containers in which radioactive materials are stored and the amount of licensed or (USAF permitted) radioactive material exceeds 10 times the amount specified in Title 10 CFR Part 20, Appendix C. Such an area or container shall be posted with **magenta and yellow** signs (tags or labels) bearing a radiation symbol and the words "CAUTION--RADIOACTIVE MATERIALS."

5.9.1.2.6. Restricted Areas. Restricted area means any area for which access is controlled for the purpose of protecting individuals from exposure to ionizing radiation and radioactive materials. This includes areas where radiation levels, if any individual were continuously present in the area, could result in a person receiving a TEDE whole body dose in excess of 2 mrem in any one hour or 100 mrem per year. Unless specified by the applicable PRSO or IRSO, restricted areas shall be posted in accordance with the guidance above.

5.9.1.3. When a restricted area or space does not have a clearly defined boundary, the use of ionizing radiation hazard warning rope (yellow and magenta) is authorized. A sufficient number of appropriate radiation hazard warning signs shall be attached to identify the particular hazard beyond the boundary of the rope.

5.9.1.4. Conspicuously post the most current US NRC Form 3, and any other instructions to workers as required by US NRC, US EPA, and US Occupational Safety and Health Administration (OSHA) regulations, AFI 40-201, and this instruction.

5.10. Area Access Control Requirements.

5.10.1. The user organization will control access to restricted areas on KAFB. No personnel shall enter a restricted area without URSO approval and the appropriate radiation dosimetry. Violations of such shall be regarded as incidents. In such cases, the user organization shall secure operations, escort the violator out of the restricted area, record the violator's name, organization, supervisor's name, and telephone number. This information shall be immediately reported to the applicable PRSO, IRSO, or BEF for investigation and dose determination.

5.10.2. All personnel must wear appropriate radiation dosimetry while working in restricted areas. The preferred dosimeter is a TLD issued by the BEF. Each individual to whom a TLD badge is issued must put on the TLD badge immediately before entering a restricted area. Upon leaving the restricted area, remove the badge and place it in an approved storage area, outside of any influences from potential occupational ionizing radiation exposure, on the control board. Dosimeters should not be worn home or out of the restricted area during lunch. Dosimeters shall never be shared between individuals.

5.10.3. Wear direct-reading radiation dosimeters whenever required by approved operating procedures. The use of these devices is mandatory in potentially high radiation areas.

5.10.4. Use a log when direct-reading radiation dosimeters are used. The log will contain the following user information: name, social security number, organization, organization address, initial reading of the dosimeter, final reading of the dosimeter, net exposure, and type and model of dosimeter used.

5.10.5. Record the direct-reading radiation dosimeters readings in a log every day that they are used and notify the applicable PRSO, IRSO, or BEF if any individual's dosimeter results indicate an exposure of greater than 125 mrad in a quarter.

5.10.6. Use of independent radiation monitors such as "chirpers" is highly recommended in potentially high-radiation areas.

5.11. Use of Radioactive Materials Off KAFB. Users, under the jurisdiction of the 377 ABW will adhere to the requirements of any USAF radioactive materials permit, AFI 40-201, and this

instruction. If more restrictive, the radiation safety requirements of the off-base location will also apply.

5.12. Surveys.

5.12.1. The applicable PRSO will conduct routine permit compliance surveys. The IRSO will conduct special radiation surveys, as necessary, to ensure exposures to all individuals are kept ALARA. Surveys may be conducted at the expense of the requesting organization if so stated in the SA or any MOAs.

5.12.2. The 377 ABW may charge associate organizations for the expenses associated with conducting emergency surveys that are required to maintain KAFB in regulatory compliance. These surveys may be conducted without the request by the associate organization. Whenever possible, the applicable PRSO, IRSO, or BEF will notify such organizations of the regulatory requirement for a pending survey in advance of it being conducted.

5.12.3. **Types Of Radiation Surveys.**

5.12.3.1. Exposure rate or count rate surveys are those conducted using a portable instrument to detect alpha, beta, gamma, X-ray, or neutron radiations. These are typically performed in and around areas where radioactive materials and ionizing radiation producing devices are located and used.

5.12.3.2. Swipe or contamination surveys are those conducted using a round filter paper (e.g., 47 millimeter filter paper) to swipe areas of suspected removable radioactive contamination. The swipe is gently rubbed over a 100 cm^2 (centimeters squared) area. Package surveys require the swipe of a 300 cm^2 area. The filters can be counted in the field and are almost always sent to a suitable radioanalytical laboratory for evaluation.

5.12.3.3. Walk through surveys are those conducted in all areas where radioactive material, ionizing radiation producing devices, and where radioactive contamination is suspected.

5.12.4. Organizations that maintain radioactive material and ionizing radiation producing devices on KAFB must permit the applicable PRSO, IRSO, or BEF to make "no notice" surveys. These surveys will be performed on a noninterference basis. Organizations subject to these surveys are responsible for ensuring that the applicable PRSO, IRSO, or BEF possess the security clearances, identification cards, and supplementary instructions necessary to access the areas needing to be surveyed.

5.13. Instrument Maintenance and Calibration.

5.13.1. **Maintenance**. Radiation detection indication and computation (RADIAC) will have maintenance and calibration, to include priority service, provided by the Test, Measurement, and Diagnostic Equipment (TMDE), Precision Measurement Equipment Laboratory flight (377 MXS/MXMD).

5.13.2. Users of RADIAC equipment will check for the presence of radioactive contamination prior to the equipment being submitted to 377 MXS/MXMD for maintenance or calibration.

5.13.3. During an emergency operation in the field, where large numbers of radiation detection and measurement instruments are in continual use, field repair and calibration facilities will be supported by the 377 LG/LGMD or suitable alternative.

5.13.4. **Calibration.** Unless otherwise specified by 377 MXS/MXMD for earlier calibration (and depending on the intended application), each radiation detection or measurement instrument shall be calibrated at intervals not to exceed one year. Similar instrumentation used for radiographic operations under the conditions of Title 10 CFR, Part 34, *Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations,* shall be calibrated every three months.

5.13.5. Calibration intervals for RADIAC equipment will be assigned using TO 33K-1-100-1, *Test Measurement Diagnostic Equipment (TMDE) Calibration Notes.*

5.13.6. The applicable PRSO, IRSO, or BEF shall notify 377 MXS/MXMD of emergencies that require the expedient calibration or maintenance of instruments. The 377 MXS/MXMD shall make every effort to comply with emergency requests.

5.13.7. Interim checks on the quantitative performance of radiation detection and measurement instruments shall be performed with small sources (check sources) of radioactive material. Whenever possible, check sources shall emulate the primary energies of the radioactive materials or ionizing radiation for which the instrument is being used.

5.14. Radiation Safety Training. Training required by this section will be documented and kept on file for three years. Copies of organization ionizing radiation safety training records will be submitted to the BEF upon request**.**

5.14.1. Supervisors responsible for operations involving the use of radioactive materials and for devices that produce ionizing radiation must ensure that all workers entering restricted areas are oriented in basic radiation protection standards, radiological safety work practices, and if necessary, methods of decontamination and contamination control.

5.14.2. Supervisors are responsible for ensuring that all workers identified in paragraph 5.14.1 are provided with ALARA training on an annual basis.

5.14.3. The URSO or PRSO will make sure that authorized users, workers, potentially pregnant or pregnant females, and ancillary personnel who may be exposed to ionizing radiation are instructed in the ALARA philosophy and informed that the 377 ABW, the PRSO, and the IRSO are committed to furthering the ALARA concept.

5.14.4. Supervisors, URSOs, and PRSOs shall direct requests for ALARA briefings and workplace specific radiation safety training to the BEF.

5.15. Emergency Procedures.

5.15.1. Emergency procedures begin when an accident or incident causes the release, escape, or spill of radioactive materials resulting in (as defined in paragraph 5.9.1.2) excessive contamination or ionizing radiation exposure of personnel, facilities, or environmental resources. Any amount may be determined to be excessive depending on the receptor, environmental conditions, radiotoxicity of the isotope, uptake fraction of radioactive material, and complicating factors (e.g., prior injury, perceived hazard, and location of accident or incident). The emergency response phase extends through the completion of efforts to save lives, prevent serious injury or prevent further damage to valuable property.

5.15.2. Information about accidents or incidents will be released to outside agencies (non-USAF) only through the 377 ABW Public Affairs representative. If a potentially harmful release of radioactive material occurs, the following general emergency procedures should be carried out.

5.15.2.1. Turn off all fans (excluding fume hoods designed for radioactive material), close windows, close heating, ventilation, and air conditioning air returns, evacuate the area while minimizing the spread of contamination, and close all doors. Notify all individuals in close proximity to the potentially harmful release of radioactive material to do the same.

5.15.2.2. For spills of radioactive material in liquid form, bring upright spilled containers, don the appropriate level of PPE (e.g., latex gloves), place absorbent around the area of the spill, and evacuate the area in accordance with paragraph 5.15.2.1.

5.15.2.3. Notify fire department by using 911 for all emergencies. Consolidate potentially contaminated individuals in one location and immediately notify the URSO, area supervisor, applicable PRSO, IRSO, or BEF. Only the applicable PRSO or IRSO will notify the RIC. The BEF will first notify a medical treatment facility (e.g., USAF or Veterans Administration (VA) Emergency Room) and then notify Ground Safety (377 ABW/SE), 377 MSG/CEIE or Safety Office, Air Force Research Laboratories, Detachment 8 (AFRL/SE DET8).

5.15.2.4. Make an accounting of all personnel from the evacuated areas. Do not allow personnel involved with the accident or incident to leave the area until cleared by the applicable PRSO, IRSO, or BEF.

5.15.2.5. Personnel directly involved with the accident or incident and have been cleared of any exposure or contamination shall remain to brief the supervisor, URSO, and the applicable PRSO, IRSO, or BEF on the details of the event.

5.15.3. All personnel involved within the accident or incident are monitored for the radioactive contaminates of interest. Contaminated individuals shall be segregated and decontaminated. Seriously injured individuals shall be immediately transported to a medical treatment facility (e.g., USAF or VA Emergency Room).

5.15.4. Ensure that the medical treatment facility and attendant personnel are aware that the injured individual is potentially contaminated with radioactive material. Identify the radionuclide of contamination to the attendant personnel.

5.15.5. Seriously injured individuals shall not be denied medical treatment due to potential or verified radioactive material contamination. Decontamination at the site of the accident or incident shall not aggravate the injuries of a seriously injured individual. Under no circumstances shall an individual's body be wrapped in plastic, soaked in water or solvents, or stripped of all clothing. These actions may create hyper or hypothermia in an individual and make decontamination extremely difficult. A clean sheet is suitable for keeping radioactive contamination on an individual's body from spreading.

5.15.6. Decontaminate personnel, equipment, and areas under surveillance. No area decontamination shall be accomplished without the coordination of the applicable PRSO or

IRSO. The success of decontamination efforts shall be decided by the applicable PRSO, IRSO, or BEF.

5.15.7. Report all known or suspected cases of inhalation of radioactive materials to the applicable PRSO, IRSO, or BEF.

5.15.8. Only those individuals approved by the 377 MDG (possessing medical qualifications) will be permitted to treat seriously injured individuals. Ensure that seriously injured individuals are transported to a medical treatment facility (e.g., USAF or VA Emergency Room).

5.15.9. For minor injuries (e.g., cuts, abrasions, and first-degree burns) immediately flush contaminated wounds with large quantities of tap water. Do not use water for radionuclide of contamination that react violently with water (e.g., sodium-22). Ensure that injured individuals are transported to a medical treatment facility (e.g., USAF or VA Emergency Room) and follow the procedures listed in paragraph 5.15.4.

5.15.10. If an individual ingests radioactive material, inform a competent medical authority; and take no actions without proper guidance.

5.15.11. No individual suspected of contamination with radioactive material shall be permitted to return to work without the written approval of a physician and the concurrence of the applicable PRSO or IRSO.

5.16. Fire and Other Major Emergencies Involving Radioactive Material.

5.16.1. Notify all personnel to vacate the area immediately and position themselves up wind, if possible.

5.16.2. Notify the fire department and other local safety personnel using 911 system. The BEF will supply the base fire fighters with radiation dosimetry and brief fire fighters as to the location of radionuclide in the laboratory building, preferably using a floor plan of the laboratory building. Fire fighters must wear PPE and protection, even if there is no evidence of immediate ionizing radiation danger. Fire fighters should not open containers suspected of containing radioactive material without prior permission from the applicable PRSO or IRSO. When the operation is complete, fire fighters should evacuate hazardous areas and place all fire-fighting equipment in a segregated area. Equipment will be monitored and decontaminated by the BEF. Radiation dosimetry shall be returned to the BEF for processing.

5.16.3. Fire fighters' first priority should be to attempt to put out the fire if the radiation hazard is not of immediate concern.

5.17. Actions Pertaining to Possible Overexposures Indicated by Direct-Reading Radiation Dosimeters.

5.17.1. Terminate all operations that could have initiated the overexposure.

5.17.2. Immediately notify the area supervisor, URSO, and applicable PRSO, IRSO, or BEF.

5.18. Notifications. The BEF will first notify a medical treatment facility (e.g., USAF or VA Emergency Room) and then notify the 377 ABW/SE. Notifications to the RIC and other USAF organizations shall follow the additional requirements of Title 10 CFR Part 20, AFI 40-201,

AFMAN 48-125, 377 ABW instructions, and locally adopted procedures. Only the applicable PRSO or IRSO will notify the RIC.

5.18.1. Only the applicable PRSO or IRSO will notify the RIC. The BEF will first notify a medical treatment facility (e.g., USAF or VA Emergency Room) and then notify the 377 ABW/SE.

5.18.2. Follow the report requirements of Title 10 CFR Part 20, AFI 40-201, AFMAN 48-125, 377 ABW instructions, and locally adopted procedures.

5.19. Mishap Reporting. Mishaps involving radioactive materials and nuclear reactors will be reported to the 377 ABW/SEW, and as required to the agencies noted in paragraph 5.18. Such reports will comply with AFI 91-204, *Investigating and Reporting US Air Force Mishaps*.

Chapter 6

RECORDS

6.1. Radioactive Materials.

6.1.1. The BEF will maintain an inventory of all radioactive materials on KAFB. This inventory may be the combination of individual USAF permit inventories.

6.1.2. Unless otherwise replaced by BEF forms, 377 MEDGP/AMDS/SGPB Form 7, *Record of Radioactive Material Leak Tests*, will be used to maintain a history on specific radioactive sources.

6.1.3. Radioactive material inventory records will be maintained in accordance with BEF operating instructions.

6.2. Personnel Ionizing Radiation Exposure.

6.2.1. The main and official depository of personnel exposure records is the AF Radiation Dosimetry Laboratory, Wright-Patterson AFB (USAFSAM/OEAS). Exposure records received from other agencies or companies where individuals have visited and performed work in radiation areas will be sent to the AF Radiation Dosimetry Laboratory, Wright-Patterson AFB (USAFSAM/OEAS) to be added to the AF Form 1527, *History of Occupational Exposure to Ionizing*. The IRSO or the BEF will assist with any individual records requests.

6.2.2. Overexposures and abnormal exposures, as defined by AFMAN 48-125, will be investigated by the applicable PRSO, IRSO, or BEF.

6.3. Survey Records. The PRSO, IRSO, or BEF will prepare reports and keep records of radioactive material, restricted areas, and ionizing radiation producing device surveys. Organizations may request copies of completed forms from the BEF if necessary for accomplishment of their mission.

6.4. Special Reports. Following an accident or incident involving radioactive materials or ionizing radiation producing devices, the PRSO, IRSO, or BEF will prepare a report and keep records of the event. These will be provided to the applicable PRSO or IRSO. Reports required by the RIC will be prepared as per the guidance in AFI 40-201, AFI 48-148, or AFMAN 48-125. If an accident or incident is investigated under AFI 91-204, a separate investigation report releasable to agencies outside the Air Force may still be required to satisfy US NRC requirements.

6.5. Documentation of Radiation Training.

6.5.1. **Radiation Safety Training Briefings**.

6.5.2. **Working Training By Supervisors.** Radiation training given by supervisors, specific workplace radioactive material or ionizing radiation hazards will be documented on AF Form 55, *Employee Safety and Health Record,* and kept by the supervisor as part of the personnel records. Upon request, a copy of radioactive material or ionizing radiation hazard training documentation shall be provided to the BEF.

6.5.3. **Documentation of a Self-Inspection Program**. As required by USAF instructions, self-inspections (as applicable, annual or semi-annual) will be performed by the URSO, or PRSO, and documented in a permanent file. Upon request, a copy of the self-inspection report shall be provided to the BEF.

Chapter 7

STANDARDS FOR IONIZING RADIATION EXPOSURE AND RADIOACTIVE MATERIAL CONTAMINATION

7.1. Radiation Exposure Limits. The amount of ionizing radiation exposure that an individual is allowed to receive in any period of time is limited. The following exposure guides are provided as a quick reference. Refer to Title 10 CFR Part 20 and AFMAN 48-125 for definitive information on these limits. Exposure limits, referenced by any source, shall not be viewed as exposure goals by KAFB. Any intended operations that could potentially cause the limits to be exceeded must be identified to the applicable PRSO, IRSO, or BEF for evaluation.

7.2. Maximum Total Effective Dose Equivalent (TEDE). For an occupational radiation worker, this shall be 5 rem per year to the whole body, 50 rem per year to any individual organ (excluding lens of eye).

7.3. Maximum Limit to the Lens of the Eyes. For an occupational radiation worker, this shall be 15 rems per year.

7.4. Maximum Shallow Dose Equivalent. For an occupational radiation worker, this shall be 50 rems per year to the skin of any extremity.

7.5. Maximum TEDE to Fetus of a Declared Pregnant Radiation Worker. This shall be 500 mrem during the entire gestational phase of the fetus with efforts to limit the TEDE to 50 mrem per month during the pregnancy.

7.5.1. For reasons of health and safety, pregnant employees should inform their supervisors of their pregnancy as soon as possible after their pregnancy is medically confirmed. Employee pregnancies are protected as confidential and that information will not be released to anyone that does not have a job-related need to know. Declaration of pregnancy is mandatory for military females.

7.5.2. The applicable PRSO, IRSO, or BEF, in cooperation with PHF, will conduct an evaluation of each pregnant employee's workplace. The BEF will review the employee's duties to determine the probability that she could exceed the regulatory limits for ionizing radiation exposure. No waivers shall be granted to permit a pregnant female to exceed the regulatory limits for ionizing radiation exposure.

7.5.3. Supervisors shall ensure that pregnant females are allowed to continue their duties when approved by a competent medical authority. Supervisors will not permit the association of ionizing radiation exposure to a pregnant female as grounds for depriving her of any benefits normally attained by any other worker.

7.5.4. The PHF will support the BEF disposition procedures for pregnant females.

7.6. Maximum TEDE for Minors Exposed to Occupational Ionizing Radiation. Minors are individuals below the age of eighteen. They may be exposed to occupational radiation, as a consequence of their employment, that is 10 percent of the limits established for adults (e.g., 500 mrem whole body).

7.7. General Population. Ionizing radiation exposure to individuals of the general population shall not be more than 2 mrem in any one hour or 100 mrem in one year.

7.8. Non-radiation Workers, Pregnant Females, and Minors. No pregnant females shall work with unsealed radionuclides without prior approval from HQ AFMSA. Except for pregnant females, the dose shall be 10 percent of the limits specified in paragraph 7.2, 7.3, and 7.4. For pregnant females the dose shall be the limits specified in paragraph 7.5.

7.9. Medical Doses. Radiation exposure resulting from physician approved diagnostic and therapeutic medical and dental procedures shall not be included in the determination of the ionizing radiation exposure status of the individual concerned.

7.10. Maximum TEDE for Radioactive Material Contained in Various Media. Refer to Title 10 CFR, Part 20, Parts 20.1201, 20.1202, 20.1203, 20.1204, and Appendix B. These limits are not intended for routine application in programmed operations that may introduce or cause airborne or waterborne radiation concentrations greater than the unrestricted area limits. The ALARA concept will be applied to all scheduled releases of radioactive material into the environment.

7.11. Restricted Area. The concentration above natural background of radioactive material in breathing air of restricted areas shall not exceed levels derived or listed in Title 10 CFR Part 20, Appendix B. The conditions of Title 40 CFR, *Protection of Environment,* Part 61, Subpart I, apply to all releases of radioactive material into the air. The URSO is responsible for reporting all potential and actual releases of radioactive material to the applicable PRSO, IRSO, and BEF as they occur.

7.12. Unrestricted Area. The concentration above natural background of radioactive material in breathing air of unrestricted areas shall not exceed levels derived or listed in Title 10 CFR Part 20, Appendix B. The conditions of Title 40 CFR Part 61, Subpart I, apply to all releases of radioactive material into the air. The URSO is responsible for reporting all potential and actual releases of radioactive material to the applicable PRSO, IRSO, or BEF as they occur.

7.13. Release into Sewage. The concentration above natural background of radioactive material in sewage from restricted or unrestricted areas shall not exceed levels derived or listed in Title 10 CFR 20, Appendix B. Permission for sewer disposal can be obtained from the RIC.

7.14. Maximum Permissible Surface Contamination Levels. The following limits noted in Attachment 4 are the surface contamination limits for KAFB. The KAFB Radiation Protection Program guidelines require the control of sources of radioactive material in such a manner so as to preclude radiological contamination. However, if there is an accident or incident involving radioactive material that results in contamination, the limits specified shall be attained as a result of ensuring decontamination. In conjunction with the limits specified of this instruction, efforts shall be made to comply with ALARA concept.

7.14.1. The limits specified in Attachment 4 shall be used for guidance in accomplishing the radiological decontamination of PPE, facilities, materials, and equipment prior to release for unrestricted use. All decontamination operation procedures must receive prior approval of the applicable PRSO, IRSO, or BEF. Any item or area that has been decontaminated must receive written clearance from the applicable PRSO or IRSO before its release is authorized.

7.14.2. All decontamination operations will be carried out under the supervision or direction of the BEF and under such conditions so as to minimize the possibility of cross-contamination of other areas and personnel. It is important to remember that radioactive surface contamination can become resuspended, thus aiding in inhalation. Every effort must

be made to prevent resuspension (e.g., ventilation, restricted access, and controlled activities).

7.14.2.1. Where surface contamination is by both alpha and beta or gamma emitting radionuclides, the limits established for alpha and beta or gamma emitting radionuclides shall apply independently.

7.14.2.2. When referencing Attachment 4, the acronym disintegrations per minute (dpm), means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrument.

7.14.2.3. Measurement of average contamination should not be averaged over more than one square meter. For objects or less surface area, the average should be derived for each object.

7.14.2.4. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping the area with dry filter disk and assessing the amount of radioactive material on the wipe with an appropriate radiation detection or measurement instrument of known efficiency. When removable contamination of less surface area is designated, the pertinent levels should be reduced proportionately and the entire surface should be wiped.

Chapter 8

RADIATION PROTECTION PROVISIONS FOR THE CONTROL OF IONIZING RADIATION PRODUCING DEVICES

8.1. Use of Devices Designed For the Intentional Production of Ionizing Radiation. These must be approved by the IRSO or BEF prior to use. The IRSO maintains the ultimate authority as to whether or not such devices may be used on KAFB.

8.1.1. Ionizing radiation producing devices shall be operated by authorized persons who are properly trained and qualified in subject matters. Training shall include, but is not limited to, radiation protection and safe operation of the device. Operator trainees may be permitted to use such devices only under the direct supervision of a qualified operator and after having received appropriate safety training.

8.1.2. Personnel working with the ionizing radiation producing devices having the potential to exceed 100 mrem TEDE in a year shall wear a personal radiation dosimeter issued by the BEF. SAs and MOUs may require that associate organizations reimburse the 377 MDG for all expenses associated with providing dosimetry.

8.1.3. The conditions delineating posting requirements as noted in chapters of this instruction shall apply.

8.1.4. Direct-reading radiation dosimetry shall be used, in addition to TLDs, when deemed necessary by the URSO or applicable IRSO or BEF.

8.2. Fixed Ionizing Radiation Producing Devices. The facility or building housing the ionizing radiation producing device shall have a radiation protection survey performed by the BEF before initial operation is authorized by the IRSO or BEF. A copy of this survey, plus the standard operating procedures used at the facility will be placed on file with the BEF and made available to anyone performing a walk through (on request). A resurvey is required if there is a change in operating parameters, of the device or a change in the configuration or workload that could result in an increased radiation hazard.

8.2.1. Each fixed installation must receive approval to start initial operation from the IRSO or BEF. Requests for approval should include a copy of the radiation protection survey and applicable information delineated in other parts of the instruction.

8.2.2. Advanced planning for shielding requirements is highly recommended, since any modifications to facilities are costly. Consultation with the IRSO or BEF or other qualified experts in this area will eliminate unnecessary expense and numerous inconveniences.

8.2.3. A responsible individual from the user organization will be assigned as the URSO for the facility. This person shall be aware of the facility radiation hazards, the conditions of this instruction, and be able to manage the day-to-day radiation safety of personnel working with the device. This individual will be the focal point for coordination with the IRSO or BEF and will be responsible for the enforcement of the KAFB RSP at the facility.

8.3. Temporary Ionizing Radiation Producing Devices. Temporary installation includes use in such areas as hangars, buildings, and open areas where the setup of the device is not intended to be permanent.

8.3.1. Initial written approval for temporary set-up of a device shall be obtained from the IRSO or BEF.

8.3.2. Requests for approval must include copies of operating procedures and other appropriate information as requested by the provisions of this instruction.

8.3.3. The user is required to have a preoperational radiation safety survey of the device and area performed by the BEF prior to operation. The BEF should be contacted by the user at least 14 days before the operation start-up of the device.

8.3.4. Once initial approval has been received by the IRSO, the BEF must be notified again at least one day in advance of the scheduled operation. If the operation is expected to continue for an extended time period, the notification should so state.

8.3.5. Subparagraphs of 8.3. do not apply to US Food and Drug Administration (FDA) approved portable medical radiographic devices.

8.4. Radio Frequency (RF) Emitters. High energy RF emitters can produce "characteristic" X-rays as a byproduct of operation. The applicable portions of this chapter apply much in the same way as they do for fixed radiography devices. In all instances, the ALARA concept applies to the ionizing radiation that is emitted from high energy RF emitters.

Chapter 9

INDUSTRIAL RADIOGRAPHY

9.1. Portable Radiography Operations. Because of the inherently greater hazard potential to personnel from the use of sources of radiation for non-destructive test evaluation, this section is intended to provide specific guidelines to potential industrial radiography organizations that may possess, use or maintain industrial radiography devices on KAFB. The conditions of Title 10 CFR Part 34 shall be followed for the use of these devices by contractors and non-USAF associates on KAFB. For USAF users of such devices, the conditions of TO 33B-1-1, *Nondestructive Inspection Methods*, the applicable portions of this instruction, and the conditions imposed by the RIC shall also be followed.

9.1.1. Unless otherwise defined by contract specifications, SAs or MOAs, contractors and associates of KAFB using industrial radiography devices may be required to reimburse the 377 ABW for any expenses associated with BEF support of such operations.

9.1.2. Coordination of planned radiographic operations with the reasonable scheduling agencies, facility supervisor, the IRSO, and the BEF is the responsibility of the radiographic company or unit and the organization requesting the service.

9.2. Radiography Source Use. Radioactive sources must be properly licensed by the US NRC or permitted by the RIC, or agreement states (recognized by the New Mexico Environmental Department). In addition, contractors who desire to bring industrial radiography devices on to KAFB must receive a written permit from the IRSO prior to bringing radioactive sources on to KAFB.

9.2.1. A copy of current leak test certification will accompany each radioactive radiographic source. The leak test must have been performed within the previous six months.

9.2.2. Each individual involved in radiographic operations will wear the appropriate radiation dosimetry. A Pencil Dosimeter (PD) or Electronic Dosimeter (ED) log will be maintained to record the dosimeter readings for each individual. This log will be updated on a daily basis. The dosimeter log will be made available to the BEF for review upon request.

9.2.2.1. Required dosimeter log data: name of individual, social security number, organization and phone number, address or office mail code, initial reading of dosimeter, final reading of dosimeter, net exposure, and type, model, and serial number of the PD or ED used.

9.2.2.2. If a PD worn by an individual is read to be “off- scale” (i.e., usually > 200 mrad), an emergency situation will be assumed and the individual will immediately notify the URSO, supervisor, and the applicable PRSO, IRSO, or BEF.

9.2.2.3. PDs will be charged (zeroed) at the beginning of each day and must be calibrated every three months. EDs must be calibrated every six months.

9.2.2.4. Care must be taken to prevent physical shock (i.e., dropping) of a PD and to protect all dosimeters from excessive moisture and heat.

9.2.2.5. Store all dosimeters when not in use, in areas protected (shielded) from occupational ionizing radiation.

9.2.2.6. EDs that possess a "chirper" are recommended. EDs should be programmed to alarm when a dose of 10 mrem is received.

9.2.3. Ionizing radiation detection and measurement instruments used for industrial radiography survey purposes must be calibrated every three months and records must be kept of each calibration. Two properly calibrated ionizing radiation survey meters capable of detecting the primary energies of the radioactive source shall be available for industrial radiography operations at all time.

9.2.4. For night operations, radiation hazard areas will be properly illuminated and flashing red lights will be used to identify the controlled area.

9.2.5. The radiographer shall make notification of intended radiographic operations no less than eight hours before planned operations, with additional (verification) notification upon arrival on site. Notifications shall be made to the applicable PRSO, IRSO, or BEF. If the proposed operation is canceled, postponed, or the time changed for any reason before the start of operations, the radiographer shall notify the applicable PRSO, IRSO, or BEF.

9.2.6. A minimum of two qualified radiographers must be present at all times during the conduct of radiographic operations.

9.2.7. The applicable PRSO, IRSO, or BEF shall be notified immediately of any theft or loss of a radioactive source, real or suspected personnel overexposures, or accidents or incidents involving the radiographic operations.

9.2.8. Coordination shall be made with the applicable PRSO, IRSO, or BEF for all radiographic source (radioactive material) change outs in advance of such events.

9.3. Fixed Irradiators. In addition to the requirements specified in paragraphs 9.1. through 9.2.3, the following requirements are applicable to fixed irradiators.

9.3.1. The conditions of Title 10 CFR Part 36, *Licenses and Radiation Safety for Irradiators*, shall be followed for the use of these devices. Additional permit conditions imposed by the RIC and the applicable portions of this instruction shall be followed for all irradiators used on KAFB.

9.3.2. The design for construction of a new facility or for modification to an existing facility to be used for fixed irradiators must be coordinated, reviewed, and approved through the applicable PRSO, IRSO, or BEF. The IRSO must be included in all coordination.

9.3.3. Access control must be assured by authorized and appropriately trained users of the facility. Authorized users are generally those approved by the RIC.

9.3.4. Properly post a sufficient number of ionizing radiation hazard and radioactive material warning signs on and around the facility. Consideration should be made to posting a sufficient number of bilingual (Spanish) ionizing radiation hazard and radioactive material warning signs.

9.3.5. Shielding and safety systems must conform to USAF specifications in accordance with the interpretations of the applicable PRSO, IRSO, or BEF and by the RIC.

9.4. Temporary Job Sites. In addition to the requirements for radiography operations, the following guidelines are applicable for radiographic operations at temporary job sites.

9.4.1. Restricted areas must be properly posted with appropriate ionizing radiation hazard and radioactive material warning signs. At a minimum, ionizing radiation hazard warning signs shall be posted at all sides of the 2 mrem/hr boundary. Sufficient number of signs must be posted to adequately provide warning to approaching personnel.

9.4.2. Temporary field or job-site operations should have enough radiographic personnel to adequately monitor restricted areas for possible intrusion by unauthorized personnel.

9.4.3. If the restricted area is entered by unauthorized individuals, the radiographer shall immediately terminate the radiographic operation (i.e., retract source into storage container, and shut down device), escort the individual out of the restricted area, get the name and organization of the individual and the supervisor's phone number, record the incident and provide pertinent information (i.e., time, date, length of time individual was in the area, and approximate maximum exposure rate that the individual was subjected to), and report the incident immediately to the appropriate PRSO, IRSO, or BEF.

9.4.4. If the radioactive source cannot be retracted into its storage container or becomes disconnected from the control mechanism (i.e., cable), the radiographer shall immediately evacuate the area and notify the applicable PRSO, IRSO, or BEF. Under no circumstances should a loose radioactive source be picked up without a remote handling device. Keep individuals from inadvertently entering the 2 mrem/hr boundary.

9.5. Cabinet and Other Radiography. X-ray cabinet radiography and other forms of radiography, such as neutron radiography, shall comply with the applicable requirements of this chapter in addition to any special requirements levied by the applicable PRSO, IRSO, or BEF.

Chapter 10

MEDICAL AND DENTAL RADIOGRAPHY

10.1. Basic Objective. The basic objective of the medical use of radiation is to get optimum diagnostic information or therapeutic effect with minimum exposure to the patient, to the medical personnel involved, and to the general public. The achievement of this objective depends on numerous factors, many of which involve professional judgment based on training and experience. The general guidelines presented in this section are aimed toward minimizing unproductive radiation exposure of medical personnel and patient.

10.2. Applicable Requirements. The applicable requirements of this instruction shall be followed. Any apparent conflict with this instruction shall be directed to the applicable PRSO, IRSO, or BEF for judgment. The IRSO is the final authority on the interpretation of applicability of this instruction to medical and dental radiography.

10.2.1. Medical and dental radiography equipment shall be operated by authorized persons who are properly trained and qualified in matters to include, but not limited to, radiation protection, safe operation of equipment, effects of ionizing radiation, and exposure limiting techniques. Operator trainees may be permitted to use such equipment while under the direct supervision of a qualified operator. Whenever possible, operators shall be registered with the American Registry of Radiological Technologists.

10.2.2. No individual occupationally exposed to ionizing radiation shall be permitted to routinely hold patients during exposures, nor shall any other person be used regularly for this purpose. When such assistance is needed, non-occupationally exposed persons (e.g., relative) may help. Individuals who assist in this regard will be provided with protective clothing (e.g., a lead apron). In addition, individuals who assist in this regard shall, as much as practical, be positioned outside the area of the useful beam.

10.2.3. Only persons required for the radiographic operation will be in the radiography room during exposures.

10.2.4. The useful beam of the radiography device shall be limited to the smallest area practicable and consistent with the objectives of the examination.

10.2.5. The operator shall stand behind a protective barrier during exposures. The operator shall wear protective clothing (e.g., lead apron) while assisting in fluoroscopy.

10.2.6. Medical and dental radiographs will only be taken upon the request of licensed physician or duly authorized physician assistant.

10.2.7. Gonadal shielding shall be provided whenever possible, especially for minors.

10.2.8. Individuals shall not be subjected to medical and dental radiographs solely for the purpose of demonstration or training. There are times when a patient needs to be held. The technician will <u>not</u> be that person. However, another person, wearing an apron is permissible.

10.2.9. A quality control (QC) program shall be initiated to reduce exposures through optimized techniques, choice of film and screen combinations, choice of imaging digital detector, preventative maintenance, proper film development, and calibration. A quality

assurance (QA) program shall be initiated to reduce exposures through radiologist or physician provider cross checks of radiograph diagnosis. Both QC and QA programs will reduce the amount of additional radiographs that need to be taken before a diagnosis can be made.

10.2.10. Dental operators or assistants will not hold the film, or imaging digital detector in place for the patient during exposure.

10.2.11. Whenever possible, a lead apron with a thyroid collar will be placed on patients receiving dental radiography.

10.2.12. The use of "open end" cones for dental x-ray units is highly recommended in order to reduce the amount of scattered radiation.

10.2.13. The BEF will perform radiation scatter surveys on new medical and dental radiography devices that are owned by the USAF. At the direction of the IRSO, the BEF will perform radiation scatter surveys on all radiography suites. Shielding certification surveys shall be requested from the contractor by the IRSO or BEF before medical or dental radiography devices are installed.

10.2.14. Medical and dental radiography devices owned by the USAF shall be resurveyed when a new component is added that might change the operational output, at one year intervals, or at the discretion of the IRSO or BEF.

ERIC H. FROEHLICH, Colonel, USAF
Commander

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

DoD Directive 5400.11, *Department of Defense Privacy Program*, 29 Oct 14

AFI 40-201, *Managing Radioactive Materials in the USAF*, 17 Sep 14

AFI 48-148, *Ionizing Radiation Protection*, 20 Nov 14

AFI 91-401, *Directed Energy Weapons Safety*, 5 Sep 13

AFMAN 24-204, *Preparing Hazardous Materials for Military Air Shipments*, 3 Dec 12

AFMAN 33-363, *Management of Records*, 1 Mar 08

AFMAN 48-125, *Personnel Ionizing Radiation Dosimetry*, 4 Oct 11

AFI 91-204, *Investigating and Reporting US Air Force Mishaps,* 12 Feb 14

10 CFR 19, *Notices, Instructions and Reports to Workers: Inspection and Investigations*

10 CFR 20, *Standards for Protection Against Radiation*

10 CFR 34, *Licenses for Radiography and Radiation Safety Requirements for Radiographic*

10 CFR 36, *Licenses and Radiation Safety for Irradiators*

10 CFR 40, *Domestic Licensing of Source Material*

10 CFR 71, *Packaging and Transportation of Radioactive Material*

10 CFR 835, *Occupational Radiation Protection*

29 CFR 1910.120, *Labor*

39 CFR, *Postal Services*

40 CFR, *Protection of Environment*

46 CFR, *Shipping*

49 CFR, *Transportation Operations*

TO 33K-1-100-1, *Test Measurement Diagnostic Equipment (TMDE) Calibration Notes*, 30 Nov 07

TO 33B-1-1, *Nondestructive Inspection Methods*, 15 May 14

Prescribed Forms

No Forms are prescribed by this publication

Adopted Forms

AF Form 55, *Employee Safety and Health Record*

AF Form 813, *Request for Environmental Impact Analysis*

AF Form 847, *Recommendation for Change of Publication*

AF Form 1527, *History of Occupational Exposure to Ionizing*

US NRC Form 241, *Report of Proposed Activities in Non-Agreement States*

US NRC Form 3, *Notice to Employees*

377 MEDGP/AMDS/SGPB Form 7, *Record of Radioactive Material Leak Tests*

Abbreviations and Acronyms

377 ABW/CC—Commander, 377th Air Base Wing

377 MSG/CC—Commander, 377th Mission Support Group

377 MDG/CC—Commander, 377th Medical Group

377 LRS/CC—Commander, 377th Logistics Readiness Squadron

377 MSG/CEIE—Environmental Management Element Director

377 MSG/CEMX—Emergency Management Office

377 LRS/LGRQ—Supply Division Inspection Section

AEA—Atomic Energy Act of 1954

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFGSC/SG—Surgeon General, Air Force Global Strike Command

AFMSA—Air Force Medical Support Agency

AFRIMS—Air Force Records Information Management System

AFRL/SE DET 8—Safety Office, Air Force Research Laboratories, Detachment 8

AFRRAD—Air Force Radioactive Recycling and Disposal

AFSC—Air Force Specialty Code

ALARA—As Low As Reasonably Achievable

ANG—Air National Guard

BEF—Bioenvironmental Engineering Flight

CE—Civil Engineer

CFR—Code of Federal Regulations

CM^2—Centimeters Squared

DAC—Derived Air Concentration

DOD—Department of Defense

DOE—Department of Energy

DOT—Department of Transportation

DPM—Disintegrations Per Minute

EA—Environmental Assessment

ED—Electronic Dosimeter

EPA—Environmental Protection Agency

FDA—Food and Drug Administration

IFB—Invitation for Bid

IRSO—Installation Radiation Safety Officer

LLRW—Low level radioactive waste

LLW—Low level waste

MAJCOM—Major Command

MDG—Medical Group

mrad—Milli-Radiation Absorbed Dose

mrad/hr—Milli-Radiation Absorbed Dose Per Hour

mrem—Milli-Radiation Equivalent Man

mrem/hr—Milli-Radiation Equivalent Man Per Hour

MOU—Memorandum of Understanding

NEPA—National Environmental Policy Act

NMED—New Mexico Environmental Department

NORM—Naturally Occurring Radioactive Materials

NRC—Nuclear Regulatory Commission

OPR—Office of Primary Responsibility

OSHA—Occupational Safety and Health Administration

PD—Pencil Dosimeter

PHF—Public Health Flight

PPE—Personal Protective Equipment

PRSO—Permit Radiation Safety Officer

QA—Quality Assurance

QC—Quality Control

RADIAC—Radiation Detection Indication and Computation

RF—Radio Frequency

RIC—Radioisotope Committee

RSO—Radiation Safety Officer

RSP—Radiation Safety Program

SA—Support Agreement

SG—Surgeon General

TEDE—Total Effective Dose Equivalent

TLD—Thermoluminescent Dosimeter

TMDE—Test, Measurement, and Diagnostic Equipment

TMO—Traffic Management Office

UCMJ—Uniform Code of Military Justice

rad/hr—Micro-radiation absorbed dose per hour

URSO—Unit Radiation Safety Officer

USAFSAM/OEAS—Air Force Radiation Dosimetry Laboratory

VA—Veterans Administration

Terms

Accelerator Produced Radioactive Material—Radioactive material produced as the result of operating a particle accelerator.

Accident—For this instruction, an accident is an event involving a nuclear reactor, radionuclide power system, or radioactive material resulting in an uncontrolled nuclear reactor criticality resulting in damage to the reactor core or release of fission products from the reactor core to the surrounding environment or atmosphere, or a loss of control of radioactive material that presents a hazard to life, health, or property. This includes loss of control that may result in any person in an unrestricted area exceeding the limits for exposure to ionizing radiation as stated in 10 CFR 20, or any unexpected event involving radioactive material or radiation exposure which is serious enough to warrant the interest or action of officials or agencies outside the Air Force. This class includes: events having domestic or international implications, those which may cause inquiries by the public or press, and those requiring immediate notification to the NRC under 10 CFR 20.

Agreement State—Any state, territory, or possession of the United States that, by agreement with the NRC, has assumed regulatory authority over byproduct, source, and certain small quantities of special nuclear material.

Air Force Master Materials License—The single NRC license issued to the Department of the Air Force delegating to the Air Force regulatory authority over byproduct, source, and limited quantities of special nuclear material used by the Air Force.

Alternate Radiation Safety Officer (ARSO)—A person, named as such on the US Air Force Radioactive Material Permit, who is qualified to act as RSO when the primary RSO is absent. Unless otherwise requested by the permittee, the alternate RSO becomes the primary RSO when the named primary RSO leaves the organization.

Assistant Radiation Safety Officer—A person in training for the position of RSO, who may only act under the supervision of the RSO.

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

Byproduct Material—Radioactive material (except source and special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using source or special nuclear material.

Committee—The US Air Force Radioisotope Committee.

Exclusive Federal Jurisdiction—Property under the exclusive control or ownership of the federal government that has been ceded legislative power by the state or has had such power reserved from grants to the states.

Incident—For this instruction, an incident is any event involving a nuclear reactor radionuclide power system or radioactive material that is not defined as an accident or which may result in adverse public reaction. This includes possible premature release of information.

License—Written authorization from the NRC or an agreement state to receive, possess, use, or transfer byproduct, source, or special nuclear material. Written authorization from a state to receive, possess, use, or transfer naturally occurring radioactive material or accelerator produced radioactive material.

License (General)—A general license, published in NRC or agreement state regulations, that is effective without any need to send an application to, or which is effective to any applicant on registration with, the NRC or an agreement state.

License (Specific)—**A** specific license issued by the NRC or agreement state to a named applicant who has filed an application authorizing acquisition, ownership, receipt, storage, use, transfer, and disposal of chemical or physical forms of radionuclides specified in the license. This license has an expiration date renewable on application to the issuing authority. The license may be limited in scope (authorizing only certain specific radionuclides for limited users) or broad (authorizing the use of a wide variety of radionuclides without regard to form, quantity, or use).

Low Level Radioactive Waste (LLRW)—Radioactive waste not classified as high level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in Section 11e(2) of the AEA (uranium or thorium tailings and waste).

Mixed Low Level Radioactive and Hazardous Wastes (Mixed LLW)—Low level radiological wastes that also contain chemical constituents that the EPA defines as hazardous in 40 CFR 261, *Identification and Listing of Hazardous Waste.*

Naturally Occurring Radioactive Material—Radioactive material that occurs in nature; that is, carbon-14, radium-226, thorium-232, uranium-238, etc.

Nuclear Reactor—A facility using fissile materials in a self-supporting chain reaction (nuclear fission) to produce heat or radiation for both practical application and research and development.

Nuclear Regulatory Commission—An agency established by Title II of the Energy Reorganization Act of 1974 (Public Law 93-438) to regulate byproduct, source, and special nuclear material as provided for by the Atomic Energy Act of 1954, as amended. Within the NRC, final authority rests with the five member commission acting as a body.

Particle Accelerator—A device that accelerates charged particles to produce a beam of high energy radiation or to produce radionuclides.

Permit—US Air Force or US Navy radioactive material permit issued to a unit within the respective service under the authority of a master materials license.

Radiation Safety Officer—An individual with specific education, military training, and professional experience in radiation protection practice appointed by the RIC and endorsed by the commander to manage radiation safety programs. The term radiation safety officer is a functional title and does not denote a commissioned status or specialty code. An RSO should be the most technically qualified person available. The RSO must have the education, military training, and professional experience needed for the job. Take care when addressing RSO qualifications and duties to distinguish between base and permit RSOs. Individuals appointed as the base RSO may not always have the specific technical experience and training needed to qualify as the permit RSO.

Radioactive Material—Materials whose nuclei, because of their unstable nature, decay by emission of ionizing radiation. The radiation emitted may be alpha particles, beta particles, gamma rays, x-rays, or neutrons.

Radionuclide Power System—A power system using the thermal energy produced by the radioactive decay of the unstable nuclei of certain radionuclide as its energy source.

Restricted Area—For this instruction, a restricted area is an area having access limited to protect individuals against undue risks from exposure to radiation and radioactive material. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

Section 91b Material—Radioactive material exempted from NRC licensing controls under Section 91b of the Atomic Energy Act of 1954, as amended, in the interest of national defense.

Source Material—Uranium or thorium or any combination thereof in any physical or chemical form or ores that have, by weight, one-twentieth of one percent (0.05 percent) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

Special Nuclear Material—Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235; any other material that the NRC determines to be special nuclear material and any material artificially enriched by the foregoing. Special nuclear material does not include source material.

Unrestricted Area—For this instruction, an unrestricted area is any area that is not a restricted area as defined in this instruction.

USAF Radioactive Material Permit—Written authorization from the USAF Radioisotope Committee for Air Force organizations to receive, possess, distribute, use, transfer, or dispose of radioactive materials. Permits parallel NRC licenses in applications and scope. Unlike the NRC, a single permit may authorize byproduct, source, special nuclear material, accelerator produced radioactive material and naturally occurring radioactive material.

USAF Radioisotope Committee (RIC) —A committee set up according to the Air Force Master Materials License to coordinate the administrative and regulatory aspects of licensing, possessing, distributing, using, transferring, transporting and disposing of all radioactive

materials in the Air Force except that transferred from the Department of Energy to the Department of Defense in nuclear weapon systems, certain radioactive parts of weapons systems and nuclear reactor systems, parts and fuel controlled under Section 91b of the AEA.

User—For this instruction, a user is an organization authorized by a USAF Radioactive Material Permit to have and use radioactive materials, or person specifically named on a USAF Radioactive Material Permit as authorized to handle or to supervise handling radioactive materials listed on the permit. A person named in a permit with local approval authority to handle or supervise the handling of radioactive materials listed on the permit.

Attachment 2

PROGRAM FOR MAINTAINING OCCUPATIONAL IONIZING RADIATION EXPOSURES AS LOW AS REASONABLY ACHIEVABLE (ALARA)

A2.1. Management Commitment. The 377th ABW, KAFB, has long been committed to keeping occupational exposure (individual and collective) ALARA. To formalize this commitment we hereby describe an administrative organization for radiation protection and will develop the necessary written procedures and instructions to foster the Air Force Global Strike Command (AFGSC) concept at our installation. The organization includes the URSO, PRSO, and IRSO. The URSOs, PRSOs, and IRSO are hereby charged with the responsibility for the enforcement of the ALARA concept.

A2.1.1. The IRSO will review the radiation protection program including ALARA considerations. The reviews will include operating procedures and past exposure records, inspections, etc., and consultations with the radiation protection staff or outside consultants.

A2.1.2. The IRSO will ensure that modification to operating and maintenance procedures and to the equipment and facilities will be made where they will reduce exposures unless the cost judgment is considered to be prohibitive. The IRSO will demonstrate, if necessary, that improvements have been sought, that modifications have been considered and they have been implemented where reasonable. Where modifications have been recommended but not implemented the IRSO will be prepared to describe the reasons for not implementing them.

A2.1.3. In addition to maintaining doses to individuals as far below the limits as reasonably achievable the sums of the doses received by all exposed persons will also be maintained at the lowest reasonable level.

A2.2. Applicable URSO, PRSO or IRSO.

A2.2.1. Annual or Semi-Annual Review.

A2.2.1.1. Annual Review of the RSP. The applicable URSOs, or PRSOs will perform as annual written review of the RSP under their control.

A2.2.1.2. Timely Review of Occupational Exposures and Ionizing Radiation Levels. The applicable RSO will review the ionizing radiation levels outside restricted areas to determine that the exposures are ALARA according to the provisions of paragraph 6 of this program.

A2.2.2. Training Responsibilities for an ALARA Program.

A2.2.2.1. Upon request, the BEF, the URSO, PRSO, or IRSO will provide briefings and/or training sessions to inform workers of ALARA program efforts. The URSO, PRSO, and IRSO will verify training is provided annually.

A2.2.2.2. The BEF will ensure that authorized users, workers and ancillary personnel who may be exposed to ionizing radiation will be instructed in the ALARA philosophy and informed that the 377th Air Base Wing, URSO, PRSO, and IRSO are committed to implementing the ALARA concept.

A2.2.3. Cooperative Efforts for Development of ALARA Procedures. Radiation workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

A2.2.3.1. The URSO, PRSO and IRSO will be in close contact with all users and workers in order to develop ALARA procedures for working with radioactive materials and ionizing radiation sources.

A2.2.3.2. The URSO, PRSO and IRSO will receive and evaluate the suggestions of individual workers for improving health physics practices and encourage the use of legally applicable procedures.

A2.3. Authorized Users.

A2.3.1. The authorized user will consult with and receive the approval of the applicable URSO, PRSO or IRSO during the planning stage before using radioactive materials for a new procedure.

A2.3.2. The authorized user will review all procedures before using radioactive materials to ensure that exposures will be kept ALARA.

A2.4. Occupational Radiation Workers.

A2.4.1. The applicable URSO, PRSO or IRSO will instruct each worker of the ALARA concept and its relationship to the individual's working procedures and working conditions.

A2.4.2. Each worker will know that reporting actions are available if workers feel that ALARA is not being promoted on the job.

A2.5. Establishment of Investigational Levels. The 377th Air Base Wing establishes investigational levels for occupational dose due exposure to ionizing radiation. When these investigational levels are exceeded the applicable URSO, PRSO or IRSO will take action as per the table below. The investigation levels that have been adopted are:

Table A2.1. Investigational Levels.

ALARA Level	Quarterly TEDE [rem]	Action Taken
ALARA I	0.125	Individual notified and reminded of procedures and techniques to maintain occupational exposure ALARA.
ALARA II	0.500	Individual notified, receives a questionnaire from IRSO due back to the IRSO in 14 days, and reminded of procedures/ techniques to maintain occupational exposure ALARA.
Abnormal Exposure	1.250	Full detailed investigation as per the guidance and procedures in AFMAN 48-125. Direct supervisor and chain of command notified.

Attachment 3

MAXIMUM PERMISSIBLE CONTAMINATION LEVELS (PER AFI 48-148).

Figure A3.1. Maximum Permissible Contamination Levels.

Nuclide	Removable[2,4]	Total (Fixed + Removable)[2,3]
U-nat, ^{235}U, ^{238}U, and associated decay products	[7] 0.17 Bq/cm^2 (1,000 dpm/100 cm^2)	[7] 0.83 Bq/cm^2 (5,000 dpm/100 cm^2)
Transuranics, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	0.0033 Bq/cm^2 (20 dpm/100 cm^2)	0.017 Bq/cm^2 (100 dpm/100 cm^2)
Th-nat, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{131}I, ^{133}I	0.033 Bq/cm^2 (200 dpm/100 cm^2)	0.17 Bq/cm^2 (1,000 dpm/100 cm^2)
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and others noted above[5]	0.17 Bq/cm^2 (1,000 dpm/100 cm^2)	0.83 Bq/cm^2 (5,000 dpm/100 cm^2)
Tritium and tritiated compounds[6]	1.7 Bq/cm^2 (10,000 dpm/100cm^2)	N/A

Note: This table is extracted from 10CFR835, Appendix D and NUREG-1575, Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME), Supp.1, Table E.1. In general, this table will not apply to contingency operations. For contingency operations follow the COCOM, or equivalent, directives.

1 The values in this appendix, with the exception noted in footnote 5, apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where surface contamination by both alpha-and beta-gamma emitting nuclides exists, the limits established for alpha-and beta-gamma-emitting nuclides apply independently.

2 As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

3 The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm2 is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) From measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm2 area exceeds three times the applicable value.

4 The amount of removable radioactive material per 100 cm2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note: The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm2 is determined, the activity per unit area shall be based on the actual area and the entire surface shall be wiped. It is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

5 This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

6 Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value provided in this appendix is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore, a "Total" value does not apply.

7 (alpha)