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Aerospace Medicine

**OCCUPATIONAL SAFETY AND HEALTH
RADIATION PROTECTION PROGRAM**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFPD 48-1, *Aerospace Medicine Program*, and gives guidance for all commanders, radiation safety officers (RSO), and all personnel whose duties involve exposure to radiation. It's divided into two distinct parts: Governing the radio frequency (RF) radiation (non-ionizing) protection program and; Governing the ionizing (that is, x-ray) radiation protection program. This publication does not apply to the US Air Force Reserve or Air National Guard units and members.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

1. RF Radiation Program:

1.1. General. RF radiation as governed by this instruction is electromagnetic energy emitted at frequencies from 10 kilohertz (kHz) to 300 gigahertz (GHz). AFOSH Standard 161-9, *Exposure to Radio Frequency Radiation*, is the Air Force Standard that governs the RF program. This section of this instruction provides guidance to implement the local **ELMENDORF AFB RF** protection program.

1.2. Application. The following organizations are required to appoint a unit RSO for RF radiation: 3 CS, 3 EMS, 3 CRS, 3 OSS, 3 SPS, 19 FS, 54 FS, 90 FS, 381 IS, 517 AS, 632 AMSS, 3 TRNS/LGTT, and 962 AACs.

NOTE:

The term "RSO" is a functional title and is not intended to denote a commissioned status or a job classification within the Air Force.

1.3. Responsibilities. Any questions concerning the policies of this section may be directed to the Base RSO (3 AMDS/SGPB).

1.3.1. The 3 AMDS Bioenvironmental Engineering Flight (SGPB) is responsible for compiling an inventory of all Base RF emitters, evaluating hazardous RF emitters, assisting unit RSOs in conducting the unit RF program, and conducting investigations of incidents of alleged or actual overexposures to RF radiation.

1.3.2. The commanders of the squadrons listed in paragraph 1.2, this instruction, are responsible for appointing a unit RSO and furnishing a copy of the appointment letter to 3 AMDS/SGPB.

1.3.3. All commanders on this installation that have personnel working in the vicinity of RF radiation emitters are responsible for educating their personnel on the hazards of RF radiation.

1.3.4. The 3 AMDS Public Health Flight (SGPM) is responsible for providing occupational health training concerning RF radiation when requested by a unit RSO, or a unit commander.

1.3.5. Unit RSOs are responsible for preparing unit operating instructions (OI) to identify and control personnel access to areas containing potentially hazardous RF radiation levels. The unit RSO will forward the unit OIs to the Base RSO for review before actual implementation or publication of the procedures in the OI.

1.3.6. All personnel that work with or work near RF radiation should know the procedures necessary to reduce or eliminate RF exposure. Also, personnel should know the actions to implement in the event of a suspected RF exposure.

1.4. Procedures. The actual procedures and content of the base and unit RF RSO programs are clearly stated in AFOSH Standard 161-9. Consult the AFOSH Standard or contact the Base RSO if questions arise on this topic.

2. Ionizing Radiation Protection As Low As Reasonable Achievable (ALARA) Program:

2.1. General. The ALARA concept governs the Base Radiation Protection Program. This part of the instruction implements paragraph F.2. of the Department of Defense Instruction (DODI) 6055.8, Occupational Radiation Program, 3 January 1983, and AFI 40-201, Managing Radioactive Materials *in the USAF*. Whenever the term “radiation” appears in this section, it’s understood to mean “ionizing radiation” or radiation in that part of the electromagnetic spectrum which is capable of producing ions, directly or indirectly, by interaction with matter.

2.2. Application. This guidance applies to all Air Force military and civilian personnel working at Elmendorf AFB whose duties require they supervise work, or work in areas, where exposure to ionizing radiation may occur. It also applies to persons not occupationally exposed (that is, general public) to the extent that it addresses controls to protect the public from potential hazards from sources of ionizing radiation owned or operated by the Air Force. This guidance is not intended to apply to the exposure of patients by the Medical Services during diagnostic or therapeutic procedures, nor does it apply to exposures of personnel to radiation resulting from the employment of nuclear or thermonuclear weapons in combat.

2.3. Policy. It’s Air Force policy that all exposures to ionizing radiation be ALARA. There should be no exposure to ionizing radiation without an expected benefit and the dose received should be the lowest possible, consistent with the state technology, cost, and operational requirements. Radiation should be kept as far below existing standards as possible.

2.4. Definitions:

2.4.1. ALARA Concept. That set of management and administrative actions taken to reduce personnel radiation dose to as low as possible consistent with existing technology, cost, and operational requirements. The ALARA concept was developed in response to scientific evidence that suggests that no level of radiation exposure is totally risk free. While the established maximum permissible doses are conservative and offer a low risk of adverse health effects, it's prudent every effort be made to reduce exposures to the lowest level that is reasonable achievable and thereby lower the health risk associated with that exposure.

2.4.2. RSO. The individual designated by the commander to manage radiation protection programs. The RSO provides consultation and advice on the hazards associated with radiation and effectiveness of measures to control these hazards. This individual will be the most technically qualified person available and should have specific education, training, and professional experience to assure a capability commensurate with the assignment. The term "RSO" is a functional title and is not intended to denote a commissioned status or a job classification within the Air Force. There are four distinct categories of RSO on Elmendorf AFB:

2.4.2.1. **Unit RSO.** The individual designated by the unit commander to act as the single focal point for the unit on radiation protection matters. Each operational unit which operates radiation producing devices, or uses radio- active materials, will appoint a unit RSO. This individual coordinates radiation surveys and hazard evaluations with the Base RSO or the Permit/License RSO, assists in investigations of suspected or actual overexposures, and performs those radiation protection duties at the unit level which are commensurate with his/her training and experience. The following organizations are required to appoint a unit RSO for ionizing radiation: 3 AMDS/ SGPB, 3 CES/CED, 3 CES/CEXD, 3 CRS/LGMV, 3 CRS/LGMDA, 3 DS/SGD, 3 DS/SGD2, 3 EMS/LGMFN, 3 MDOS/ SGOEE, 3 MDOS/SGOPO, 3 MDOS/SGOSBA, 3 MDOS/SGOSO, 3 MDOS/SGOSU, 3 MDSS/SGSARN, 3 MOS/ SGSAR, 3 MSS/SGSLE, 3 TRNS/LGTT, 611 CES/CEOR, 632 AMSS/TRK, and 632 AMSS/TRP.

2.4.2.2. Permit/License RSO. The individual designated by the unit commander, and approved by the USAF Radioisotope Committee or Nuclear Regulatory Commission (NRC), to manage the radiation protection aspects associated with the use of radioactive materials for which a specific USAF Radioactive Material Permit or an NRC License has been issued. The following organizations on Elmendorf AFB will appoint a Permit/License RSO: 3 AMDS/SGPB, 3 CRS/ LGMV, 3 CRS/LGMDA, 3 CES/CEXD, 3 MDSS/SGSARN, and 611 CES/CEOR.

2.4.2.3. Medical Facility RSO. The individual designated by the Director of Base Medical Services to manage the medical facility's radiation protection program. A physician will be identified as Medical Facility RSO for nuclear medicine. The 3rd Medical Group Commander will appoint the Medical Facility RSO.

2.4.2.4. Base RSO. The individual designated by the installation commander to manage the Base Radiation Protection program. This individual should be the base Bioenvironmental Engineer or Health Physicist, if assigned, but may be a Bioenvironmental Engineering Technician (AFSC 4BOX0) with special experience identifier SEI 492. This individual will conduct the base-wide radiation protection program which will include the surveillance of all radioactive materials and radiation producing devices. The Base RSO coordinates with and assists the Unit, Permit/ License, and Medical Facility RSOs, as necessary, to ensure a comprehensive,

coordinated radiation protection program. The 3rd Wing Commander will appoint the Base RSO.

2.5. Requirements:

2.5.1. Overview. The ALARA program requirements contained herein apply to each functional area where radioactive materials or radiation producing devices are used and to each respective RSO. It's the intent of this instruction that each RSO perform the required tasks for their specific areas of responsibility. The Base RSO will coordinate with the respective functional area RSOs to ensure a comprehensive, coordinated base-wide radiation protection program. It's the responsibility of each organization to acquire and maintain the appropriate radiation monitoring equipment needed to comply with the requirements for each section.

ALARA program requirements for the personnel dosimetry program.

2.5.1.1. The Base RSO will conduct radiation dosimetry in all functional areas in accordance with guidance established in AFI 48-125, *The US Air Force Personnel Dosimetry Program*. The following areas on Elmendorf AFB are routinely monitored with thermoluminescent dosimeters (TLD):

AREA	LOCATION	EXCHANGE FREQUENCY
F	3 EMS/LGMFN-N.D.I	Monthly
H	3 MSS/SGSAR-Radiology	Monthly
Z	3 MSS/SGSARN-Nuclear Medicine	Monthly
G	3 MSS/SGSLE-M.E.R.C	Quarterly
J	3 CRS/LGRTA-P.M.E.L	Quarterly

The Base RSO will review and sign the dosimetry results sheet (Armstrong Laboratory (AL) Listing 1499) (Air Force Laboratory located at Brooks AFB TX) when received from USAF AL. On an annual basis, USAF AL will prepare an AF Form 1527, *History of Occupational Exposure to Ionizing Radiation*, before sending the forms to the Unit RSOs for review. Each individual monitored on the TLD program will review the AF Form 1527, sign and date it, and return the form to SGPB.

2.5.1.2. Normally, the TLDs will be exchanged the first working day of each month for those areas on the monthly cycle. The quarterly TLDs will be exchanged the first working day in January, April, July, and October. The Base RSO will also maintain an extra supply of TLDs

for issue at a Broken Arrow accident or incident. The TLDs designated for Broken Arrow response will not be issued for routine monitoring in radiation areas already under surveillance.

2.5.1.3. The following personnel dosimetry action levels have been established and will be used by the Base RSO as a guide in determining surveillance and control requirement. Action levels include: 100 mrem Whole Body and 300 mrem Finger Ring.

2.5.1.3.1. Overexposure Action Level. A personnel dosimetry result which exceeds the maximum permissible dose (3000 mrem per quarter). Formal investigation and documentation of the incident is required in accordance with AFI 48-125.

2.5.1.3.2. Abnormal Exposure Action Level. Personnel dosimetry result which, if continued on an annual basis, would result in an overexposure of 5000 mrem. This equates to 417 mrem on a monthly badge or 1250 mrem on a quarterly badge. A formal investigation to determine the cause of the exposure **MUST** be made in accordance with AFI 48-125.

2.5.1.3.3. Pregnant Female Action Level. Personnel dosimetry result which, if continued for the term of pregnancy, would exceed the 500 mrem exposure limit for the fetus (reference HQ AFMSC/SGPA policy letters, Occupational Exposure of Fertile Women to Ionizing Radiation, 4 August 1983 and 21 November 1983). This equates to approximately 50 mrem on a monthly badge. Personnel dosimetry results above this level **MUST** be investigated and findings of the investigation reported to the local Wing Safety Council and Aerospace Medicine Council.

2.5.1.3.4. Personnel Dosimetry Results For Pregnant Female Workers. Will be reviewed by the Base RSO monthly and documentation maintained on actions taken to ensure the total dose to the fetus does not exceed 500 mrem during the term of pregnancy. Positive efforts should be made to limit the dose to no more than 50 mrem per month.

2.5.1.4. Unit RSOs involvement with the personnel dosimetry program. The unit RSO:

2.5.1.4.1. Should review the AL listing 1499 after they are sent to the section. The AL listing 1499 should be maintained in the section "health and safety" or AFOSH file. Unit RSOs are responsible for ensuring the enrollment of assigned personnel to SGPB. Unit RSOs must also ensure TLDs are stored in the designated storage area near but outside the radiation area.

2.5.1.4.2. Is responsible for ensuring the TLDs are available for exchange on the day designated. Any lost, damaged, or suspected overexposed TLDs should be reported to the Base RSO as soon as possible.

2.5.1.4.3. Is responsible for ensuring temporary duty (TDY) personnel are indoctrinated on the Elmendorf AFB TLD program and are issued temporary TLDs, if needed. If personnel from Elmendorf AFB go TDY to another installation (that is, precision measuring equipment laboratory (PMEL), x-ray personnel), the unit RSO must notify the Base RSO of this fact if the period of the TDY conflicts with the normal exchange frequency (monthly or quarterly) of the TLDs. Unit RSOs should remind their personnel in the event of a TDY to carry their own TLD on the TDY mission. This aspect of the TLD program should be covered closely in the unit RSOs radiation protection program.

2.5.2. Radiation Surveys:

2.5.2.1. Base RSO:

2.5.2.1.1. Will conduct a radiation survey, using USAF OEHL Report 85-144RIHYA, on a periodic basis in the following areas: 3 AMDS/SGPB, 3 CES/CED, 3 CES/CEXD, 3 CRS/ LGMVS, 3 CRS/LGMDA, 3 DS/SGD, 3 DS/ SGD2, 3 EMS/LGMFN, 3 MDOS/SGOEE, 3 MDOS/SGOPO, 3 MDOS/SGOSBA, 3 MDOS/SGOSO, 3 MDOS/SGOSU, 3 MDSS/SGSARN, 3 MOS/SGSAR, 3 MSS/SGSLE, 3 TRNS/LGTT, 611 CES/CEOR, 632 AMSS/TRK, and 632 AMSS/TRP.

2.5.2.1.2. The survey will be conducted with the Unit or License/Permit RSO, as required. Specific items of interest to be covered during the survey include: Review of the dosimetry results; the adequacy of storage areas; changes in operating procedures or equipment; physical layout of the shop; radiation training folder; leak tests (if required); placement of warning signs and labels; the adequacy of reference material and TOs, as needed; radiation measurements with ADM 300, AN/PDR-27 or 440RF shielded instruments, as needed; requirements for lead shielding or engineering controls; and any other item required in accordance with current health physics practices.

2.5.2.2. Unit or License/Permit RSO:

2.5.2.2.1. Will conduct a quarterly review of all pertinent items included in paragraph 2.5.3.1.2, this instruction, and document the finding in the unit AFOSH or radiation folder.

2.5.2.2.2. Forward a copy of the finding noted in the quarterly survey to the Base RSO.

2.5.3. Leak Testing Procedures:

2.5.3.1. Base RSO:

2.5.3.1.1. Will review the leak tests performed by the unit RSOs from 3 AMDS/SGPB, 3 CRS/ LGMDA, 3 CES/ CEXD, 3 MDSS/SGSARN, and 611 CES/CEOR on the radioactive sources located in their workplaces.

2.5.3.1.2. Will maintain copies of the leak test swipes in the appropriate permit/license files after annotating any pertinent remarks on the swipe results.

2.5.3.1.3. Will train bioenvironmental engineering technicians to conduct leak tests and swipes, as appropriate.

2.5.3.2. Unit RSOs from 3 AMDS/SGPB, 3 CRS/LGMDA, 3 CES/CEXD, 3 MDSS/SGSARN, and 611 CES/CEOR:

2.5.3.2.1. Will conduct leak testing of the radioactive sources located in their workplaces.

2.5.3.2.2. Will forward a copy of the swipe result to the Base RSO for inclusion into the PMEL radioactive permit file.

2.5.3.2.3. Should train an alternate technician to conduct the swipe/leak test of the radio-active sources in the event of the unit RSOs absence.

2.5.3.3. The 3 TRNS/LGTT will notify Bioenvironmental Health for outbound radioactive shipments to determine appropriate shipment procedures.

2.5.4. Permit/License Procedures:

2.5.4.1. Presently there are six USAF Radioactive Material Permits issued to Elmendorf AFB.

The permits are issued to: 3 AMDS/SGPB, 3 CRS/LGMVS, 3 CRS/LGMDA, 3 CES/CEXD, 3 MDSS/SGSARN, and 611 CES/CEOR.

2.5.4.2. Applications for initial issue and renewal of existing permits should be directed to the Base RSO (in triplicate) in accordance with procedures outlined in AFI 40-201 and NRC Form 3131. The renewal of existing USAF Radioactive Material Permits should be forwarded to the Base RSO at least 90 days prior to the expiration date of the permit. The unit RSO should review the permit application prior to forwarding it to the Base RSO.

2.5.4.3. It's the unit RSO's responsibility to update the users and supervisors on the radioactive materials as stated on the permits. Changes should be directed to the Base RSO as directed in TO 00-11ON-3.

2.5.4.4. Civilian contractors or any other agency bringing a radioactive device (that is, soil or asphalt density meters) on Elmendorf AFB must have prior approval by the Base RSO. Base Contracting should ensure all civilian contractors are aware of this requirement. An application to bring a radioactive device on Elmendorf AFB should be forwarded to the Base RSO at least 60 days prior to the anticipated use. The application package (two copies) should include:

2.5.4.4.1. Copy of the appropriate NRC License or State Permit to operate/own radioactive device.

2.5.4.4.2. Copy of the operators qualifications and/or radiation safety training.

2.5.4.4.3. Radiation dosimetry results for the operator for the prior calendar year.

2.5.4.4.4. Statement of the expected start date and length of the contract.

2.5.4.4.5. Statement of expected storage and security requirements or other particular needs of the contractor.

2.5.4.4.6. Copies of last two leak checks (if appropriate). Under no circumstances will an unlicensed radioactive device be used on Elmendorf AFB. Any questions on a contractor's responsibility, regarding this topic, should be directed to the Base RSO prior to the contractor starting work.

2.5.5. Review of plans existing or new facilities in which radiation producing devices will be used.

2.5.5.1. All plans for modification of facilities, or design of new facilities, which involve the use of radioactive materials or radiation producing devices **MUST** be reviewed by the Base RSO to ensure ALARA is considered.

2.5.5.2. The review process and the signature of plans by the Bioenvironmental Engineer (BEE), normally the Base RSO, will be sufficient for these requirements. The predesign conferences and stages of design review (35 percent, 65 percent, and 95 percent of completion) are critical in this process. It's the users responsibility to inform the Base RSO and Design Engineering that the project involves "radiation" and that ALARA must be considered. The Base RSO will recommend engineering control (that is, lead shielding) if required to reduce the radiation exposures to ALARA.

2.5.5.3. The USAF AL Radiation Services Division (DSN 240-3486, FAX DSN 240-2288)

can also be contacted for design reviews which are beyond the technical capabilities of the Base RSO.

2.5.6. Training:

2.5.6.1. The unit RSO, with the assistance of the 3 AMDS/SGPM, will conduct radiation safety training for all individuals working in or frequenting any area where radioactive material or radiation producing devices are used. Initial training will be conducted before, or as soon as possible, after assignment to work areas involving radiation exposure. Annual refresher training courses will be conducted to reemphasize and reinforce training objectives. The level of training should be tailored to the specific category of personnel and the hazard presented. Documentation of training will be maintained locally by the respective functional area RSO and a copy will be forwarded to 3 AMDS/SGPM for inclusion in Tab F of the facility case file (AF Form 2767, *Occupational Health Training and Protective Equipment Fit Testing*). Such training will, as a minimum, include instruction in the following areas:

2.5.6.1.1. Risk from radiation exposure.

2.5.6.1.2. Health risks to children of women who are occupationally exposed to radiation during pregnancy.

2.5.6.1.3. Maximum permissible dose limits.

2.5.6.1.4. Protective measures required (tailored to specific radiation work).

2.5.6.1.5. ALARA philosophy and practice.

2.5.6.2. Unit RSOs will be responsible to request the annual training from 3 AMDS/SGPM and ensure the attendance of necessary personnel. Ten duty days notice should be provided to both the Base RSO and 3 AMDS/SGPM, prior to the training day requested.

2.5.7. Quality Assurance. The Base RSO:

2.5.7.1. Will conduct quarterly radiation program review and document the findings. The findings will be presented to the Aerospace Medicine Council and Wing Safety Council. The review will include:

2.5.7.1.1. A review of all personnel dosimetry results for the previous quarter to identify adverse trends and ensure all personnel dosimetry results which exceed action levels are acted upon.

2.5.7.1.2. A review of all radiation survey results for the previous quarter to ensure all required surveys have been performed and documented properly, and that corrective action, if necessary, has been accomplished. In addition, all quality assurance items stated in paragraph 2.5.2.3. this instruction, will be summarized in the quarterly review.

2.5.7.2. Will conduct an annual radiation program review and document the findings. The findings will be presented to the Aerospace Medicine Council and Wing Safety Council. The review will include:

2.5.7.2.1. A review of all local implementation directives (regulations and operating instructions) to ensure they are current.

2.5.7.2.2. A review of all radiation survey results for the past year to ensure all required surveys have been performed and documented properly and that corrective actions, if nec-

essary, have been accomplished.

2.5.7.2.3. A review of personnel dosimetry results for the past year to identify adverse trends and ensure appropriate actions have been taken on results that exceed standards or action levels.

2.5.7.2.4. An update of the radiation source and radioactive material inventory.

2.5.7.2.5. A review of all USAF Radioactive Material Permits and NRC licenses to ensure currency and compliance with requirements.

2.6. Summary. The Air Force policy for exposures to ionizing radiation is to keep the levels ALARA. Through education, training, and a stringent quality assurance program, the ALARA concept can be achieved.

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Commander