BY ORDER OF THE COMMANDER NIAGARA FALLS AIR RESERVE STATION

NIAGARA FALLS AIR RESERVE STATION INSTRUCTION 40-201

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Medical Command

RADIATION PROTECTION PROGRAM

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This instruction implements Air Force Policy Directive (AFPD) 40-2, Radioactive Materials (Non-Nuclear Weapons). This instruction extends the guidance of Air Force Instruction (AFI) 40-201, Managing Radioactive Materials in the US Air Force. This instruction establishes responsibilities and procedures for managing the base radiation protection program. It prescribes guidelines for personnel to keep exposure to radiation as low as reasonably achievable (ALARA). This instruction applies to all units assigned or attached to the 107th Airlift Wing (AW), 914 AW, Base Operating Services (BOS) contractor, and tenant units who acquire or possess radioactive materials, or equipment that produces radiation. It also applies to any agency or person who brings radioactive materials, or radiation producing equipment, onto this installation. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the Air Force Form 847, Recommendation for Change of Publication; route AF847 from the field through the appropriate functional chain of command. Ensure that all records created as a result of processes prescribed in this publication are maintain in accordance with Air Force Manual (AFMAN) 33-363 Management of Records and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located at **https://www.my.af.mil/gcss-af61a/afrims/afrims**/

SUMMARY OF CHANGES

This revision clarifies the responsibilities of various base officials and offices.

1. Definitions:

1.1. As Low As Reasonably Achievable (ALARA). The set of actions taken by the Radiation Safety Officer (RSO) to reduce personnel exposures to as low as possible, given the existing technology, cost, and operational requirements.

1.2. Control Dosimeter. A dosimeter that measures the background radiation accumulated during the transit and storage of personnel dosimeters.

1.3. Dosimeter. A device that detects and measures accumulated radiation exposure to personnel

1.4. Ionizing Radiation. Particles or photons that have sufficient energy to produce direct ionization in their passage through a substance (i.e., x-rays, gamma rays, alpha particles).

1.5. Laser. A device that utilizes the natural oscillations or atoms or molecules between energy levels for generating coherent electromagnetic radiation in the ultraviolet, visible, or infrared regions of the spectrum.

1.6. Non-Ionizing Radiation. Electromagnetic radiation at wavelengths that's corresponding photon energy is not high enough to ionize an absorbing molecule. All radio frequency, infrared, visible, and near ultraviolet radiation is non-ionizing.

1.7. Radiation Safety Officer (RSO). An individual with specific education, military training, and professional experience in radiation protection practice, designated by the installation commander to manage radiation safety programs.

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

1.9. Radio Frequency. A frequency at which coherent electromagnetic radiated energy is useful for communication purposes, defined as 10 KHz to 300 GHz.

1.10. Roentgen Equivalent Man (REM). The fraction of the radiation energy that a person is exposed to that is absorbed by the body. The unit used to equalize the biological consequences that result from equal absorbed doses of radiation.

1.11. Sievert (Sv). Standard international unit. One sievert equals 100 rem.

1.12. US Air Force Radioactive Material Permit. Written authorization from the US Air Force Radioisotope Committee (RIC) for Air Force organizations to receive, possess, distribute, use, transfer, or dispose of radioactive materials.

1.13. US Air Force Radioisotope Committee (RIC). A committee established according to, and the named licensee on, 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 material in the Air Force.

2. Responsibilities:

2.1. Commander: Ensures only authorized activities are conducted, establish programs to ensure activities are safely done and in compliance with requirements.

2.2. Base RSO. Must be appointed, in writing, by the installation commander. Sets up the overall installation radiation program and keeps the installation, tenant and subordinate commanders informed about radiation health and safety issues and effectiveness of measures to control radiation hazards.

2.3. Permit RSO. Listed in the permit by name. Check the receipt, storage, distribution, use, transfer, and disposal of radioactive materials for compliance with approved rules, AFI 40-201, Managing Radioactive Materials in the USAF, and permit conditions.

2.4. Functional Area RSO: Must be appointed, in writing, by the unit commander. This person, from the functional area, is the most knowledgeable on operational characteristics of the radiation source used by the unit and the hazards to personnel from radiation. This includes all units, to include tenants, which use radioactive material or radioactive producing equipment.

2.5. Workers: All personnel, including tenants, who use radioactive materials or equipment that produces radiation, must obey the permit authorizing the material, the directives listed in the instruction, local operating instructions, and the ALARA principles.

3. Personnel Dosimetry Program:

3.1. Monitoring Criteria. Dosimetry will be performed on personnel who are likely to exceed 10 percent of the occupational exposure limit. The personnel dosimetry program will be conducted in accordance with AFI 48-148, Ionizing Radiation Protection, and local base policies. Copies of personnel dosimetry results will be distributed to the respective functional areas RSOs for review and appropriate action.

3.2. Wearing the Whole Body Dosimeter. Wear the whole body dosimeter on the front of the body, below the shoulders and above the hips, on the outside of clothing. Ensure the front surface of the dosimeter faces away from the body. When using a lead apron or similar protective garment, wear the whole body dosimeter on the outside of the basic clothing but beneath the protective garment.

3.3. Securing the Dosimeter. Secure the dosimeter in the proper position on your body before entering a radiation area or handling radioactive materials. Remove the dosimeter when you leave and store it in the area with the control dosimeter.

3.4. Storing the Dosimeter. Designate a dosimeter storage area that is as remote from ionizing radiation sources as practicable. Be sure the area is free of oil, dust, or other contaminants. Do not store dosimeters in areas of high temperature and moisture. Keep a control dosimeter in the dosimeter storage area for the entire monitoring period.

4. Radiation Surveys:

4.1. Ionizing Radiation Sources. All x-ray equipment, radioactive material storage locations and areas using permitted radioactive materials will be surveyed annually by Bioenvironmental Engineering in accordance with AFI 40-201, Managing Radioactive Materials in the USAF. If possible, the surveys are encouraged to be scheduled during the annual industrial hygiene surveys.

4.2. Non-ionizing Radiation Sources. Bioenvironmental Engineering compiles and keeps a current inventory of Air Force owned or operated Radio frequency (RF) emitters. In accordance with AFOSH Standard 48-9, Radio Frequency Radiation (RFR) Safety Program, Bioenvironmental Engineering will perform periodic evaluations of the hazard potential of each emitter.

4.3. Laser Sources. Bioenvironmental Engineering compiles and keeps a current inventory of all Class IIIa, IIIb, and IV lasers operated on the installation. In accordance with AFOSH Std 48-139, Laser Radiation Protection Program, Bioenvironmental Engineering will periodically per-form surveys to determine hazards and needed protective controls.

5. Leak Testing Procedures. Leak testing of radioactive material sources will be done by the radioactive material permittee and the respective radioisotope permit. The RSO will monitor compliance.

6. Receipt, Transfer, and Shipping of Radioactive Materials:

6.1. For receipt of materials through the Base Supply and Transportation Management Office (TMO), Bioenvironmental Engineering Services (SGPB) will be contacted within three hours to conduct a survey of the package under the following circumstances:

6.1.1. Package is damaged.

6.1.2. Package has white 1, yellow 2, or yellow 3 radioactive label and has more than Type A quantity of radioactive material.

6.1.3. Monitoring is not required if:

6.1.3.1. Package is not damaged and

6.1.3.2. Package is not labeled with white 1, yellow 2, or yellow 3 label

6.1.3.3. Package has white 1, yellow 2 or yellow3 label but contains only radioactive gas or special form

6.1.3.4. Package has white 1, yellow 2, or yellow 3 label but has less than Type A quantities

6.2. All new radioactive materials or ionizing producing devices request submissions from base organizations are reviewed by the base RSO before use. The Individual Exemption Codes (IEX) codes and permit/license system will be used to control issues.

6.3. According to AFI 40-201, non-Air Force organizations that bring radioactive materials or radiation producing devices (ionizing or radio frequency producing devices to include, but not limited to, the following items, x-ray producing devices, electron beams, neutron utilizing devices, lasers, radar or other devices radiating electromagnetic energy, excluding communication radios), on Air Force installations, or conduct operations using radioactive materials on Air Force installations, must get the approval of the installation commander. To get this approval, the non-Air Force organization must send a request to the base RSO at least 30 calendar days before bringing the materials onto the installation. For contractors, these requirements must be included in the statement of work. The items required in the request are outlined in AFI 40-201, section 3.4.18.2.

7. Permit or License Procedures:

7.1. Stock Listed Items and Commodities. The base RSO will send an application in letter format to the RIC (AFMOA/SGPR) through their HQ AFRC/SGPB. The letter should include the following.

7.1.1. Name, mailing address and telephone number of the applicant and using organization (facsimile number and e-mail address, if applicable). Applicant must be a commander, or supervisor (branch chief or above).

7.1.2. Item name, stock number, number of items needed, intended use of the desired item.

7.2. Non-Stock Listed Items. Permit applicant prepares the application. The base RSO reviews the permit and forwards to HQ AFRC/SGPB, who forwards it to AFMSA/SG3PB.

7.2.1. Include the information outlined in AFI 40-201, attachment 3. Identify the item by manufacturer and model number. Each radioactive source in the item by specific radioisotope, chemical or physical form, and maximum activity. Indicate the numbers of each source needed, including spares. The intended use of the desired item.

7.3. Application Process. In response to the initial application, the applicant will receive a list conditions that the organization commander must review, sign and return to the RIC. The RIC will countersign the list of conditions and return it to the applicant as a valid permit.

7.4. Permit Amendments. Needed for changes in users, permit or base RSOs, facilities, or procedures (types and quantities of materials, shielding).

7.4.1. For termination of a permit, or for a change in users, inform the RIC within 15 calendar days.

7.4.2. Send the request to arrive at AFMSA/SG3PB no later than 30 days prior to when you need the changes.

7.5. Transfer, Disposal, and Transportation of RAM and Waste:

7.5.1. For disposal the generator, or user, will initiate a written request for disposal instructions.

7.5.1.1. The request will contain, the national stock number, nomenclature, quantity, type of radionuclide, physical form, chemical form, activity per item in curies, intensity in milliroentgen (mR)/hr at 4 inches from surface of unpackaged article, and point of contact.

7.5.1.2. The generator will forward the request to the base RSO for review and approval (first endorsement). The generator will then forward the request to AFMSA/SG3PB, 1400 Key Blvd., Nash Bldg., Suite 400, Arlington VA 33309-1554, DSN 425-0035, Commercial 703-588-0035, FAX DSN 425-5855, Commercial FAX 703-588-5855.

7.5.1.3. AFMSA/SG3PB will provide written instructions concerning disposal for the waste. They will provide guidance for disposal of all radioactive waste.

7.5.2. The user must tell the transportation office (freight) the radionuclide, activity, chemical and physical form, item nomenclature, and stock number.

7.6. Radioactive Materials Incidents and Accidents. When in doubt, report any incident to the base RSO. The base RSO will then report it to the RIC. The time limit for compliance starts from the time of discovery.

8. Quality Assurance:

8.1. Personnel Dosimetry. The following are the action levels that will serve as a guide in determining surveillance and control requirements.

8.1.1. Overexposure Action Level (Whole Body), 5 rem (0.05 Sv) per year.

8.1.2. Abnormal Exposure Action Level, 417 mrem (4.17 mSv) per month, 1250 mrem (12.5 mSv) per quarter.

8.1.3. Investigation Action Level.

8.1.3.1. Non-Destructive Inspection, 10 mrem (0.1 mSv) per year.

8.1.4. Pregnant Female Action Level, 5 mrem (0.05 mSv) per month.

8.1.5. The following personnel are not normally required to be included in the monitoring program: dental x-ray technicians, baggage x-ray operators, and Explosive Ordinance Disposal (EOD) and Office of Special Investigation (OSI) pulsed x-ray unit operators.

8.2. Pregnant Workers. Personnel dosimetry results for pregnant female workers will be reviewed by the base RSO monthly and documentation maintained on actions taken to ensure that the total dose to the fetus does not exceed 100 mrem during the term of pregnancy. Positive efforts should be made to limit the dose to no more than 5 mrem per month.

8.3. Quarterly Radiation Protection Program Reviews. These reviews will be presented to the Aerospace Medicine Council only if abnormal results or adverse trends are noted. Review:

8.3.1. All personnel dosimetry results for the previous quarter, to ensure that adverse trends are noted and that all personnel dosimetry results which exceed action levels are acted upon.

8.3.2. All radiation survey results for the previous quarter, to ensure that all required surveys have been performed and documented properly, and that corrective action, if necessary, has been accomplished.

8.4. Annual Radiation Protection Program Reviews. These reviews will be accomplished by the RSO and will be presented to the Aerospace Medicine Council and the Environmental Safety and Occupational Health (ESOH) Council.

8.4.1. A review of all local implementing directives, to ensure they are correct.

8.4.2. A review of all radiation survey results for the past year, to ensure that all required surveys have been performed and documented properly and that corrective action, if necessary, has been accomplished.

8.4.3. A review of all personnel dosimetry results for the past year, to ensure that adverse trends are noted and appropriate action has been taken on results that exceed standards or action levels.

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

8.4.5. A review of all USAF Radioactive Materials Permits and NRC licenses, to ensure currency and compliance with requirements.

9. Procedures for Radiological Incidents shall be accomplished by the radiographer in charge Emergency:

9.1. In the event of a shop emergency adjacent to an industrial radiography device, such as a fire or an accident involving personnel, the x-ray exposure shall be immediately terminated and the apparatus secured.

9.2. In the event of an accident to the x-ray tube or the control panel, such as a falling object striking either unit, the x-ray exposure shall be immediately terminated and the apparatus thoroughly checked by qualified maintenance personnel before accomplishing any future exposures.

10. Suspected Overexposure Actions:

10.1. The radiographer in charge will:

10.1.1. Immediately cease all radiography operations and report the incident to the immediate supervisor.

10.1.2. Obtain the name, social security number, organization, and location or path of travel for all personnel suspected of overexposure.

10.1.3. Notify the Maintenance Operations Center (MOC). The MOC will notify the Maintenance Group commander, Maintenance Squadron commander, Unit Safety Officer/NCO, and the Radiation Safety Officer or Bioenvironmental Engineering Services representative of the suspected overexposure. If an overexposure occurs after normal duty hours and the MOC is not manned, the radiographer in charge will make the notifications using the X-Ray Areas and Procedures Emergency Action Checklist.

10.1.4. Read and record all information from direct reading dosimeters.

10.1.5. Determine and record exact position, length/direction of travel, and duration of exposure.

10.1.6. Update the Industrial Utilization Log, to include the AF Form 190, AFTO Form 125, and AFTO Form 115, as needed. Ensure the detailed sketch of the area includes the positions of personnel suspected of being overexposed. Record all other pertinent data about the incident.

10.1.7. Obtain a signed statement from the exposed individual(s) of actions resulting in (or contributing to) the exposure.

10.2. The RSO and the NDI Laboratory Supervisor will:

10.2.1. Prepare to turn-in the affected individual's TLD badge and the control badge for immediate processing, as directed. The emergency room physician, in consultation with the RSO, will determine the need for medical treatment.

10.2.2. After completion of the above phase of the investigation, and in the case of non-monitored personnel being exposed, the RSO shall be contacted for assistance in conducting the exposure investigation. The RSO shall be on-site during all exposure measurements to assist the NDI Laboratory Supervisor in obtaining pertinent survey data. The following procedures can be used by the RSO or radiographers to quantify personnel exposure.

10.2.2.1. Re-establish the exact position(s) of all objects at the time of the accident.

10.2.2.2. Place suitable dosimetry devices at the position of the exposed individuals.

10.2.2.3. Survey meters SHALL NOT be used unless they have an integrate mode, or remote cameras are available to observe the instruments, since personnel using them will be unnecessarily exposed to radiation.

10.2.2.4. Expose the dosimeters, operating the gamma-ray or x-ray apparatus at the same technique as occurred during the incident with the time of the exposure equal to the time personnel indicated they were present in the area or enclosure.

10.2.2.5. If personnel were moving within the enclosure during the accident exposure, the dosimeters SHALL be placed at the position closest to the x-ray apparatus and at various points of their travel.

10.2.2.6. A complete report of the incident SHALL be prepared by the NDI Laboratory Supervisor and/or the unit RSO with signed statements from all operations and personnel exposed indicating their concurrence with the report. A copy of this report SHALL be proved to the Base RSO for review and filing in the industrial workplace case file. Additionally, copies will forwarded to AFMSA/SG3PB, 1400 Key Blvd., Nash Bldg., Suite 400, Arlington VA 33309-1554, DSN 425-0035, Commercial 703-588-0035, FAX DSN 425-5855, Commercial FAX 703-588-5855.

10.2.2.7. The base RSO, in conjunction with the unit safety office, will inform HQAFSC/SEW through Air Force Safety Automated System (**https://sas.kirtland.af.mil**/) ofany abnormal exposures and/or suspected overexposures to personnel or the public froma mishap involving intrinsic radiation safety (INRAD) or 91(b) material, radioactive material exempted from NRC licensing controls under Section 91(b) of the AEA of 1954, as amended, in the interest of national defense, under the possession of the DOD to include materials in nuclear weapons.

10.2.2.8. Assure a new control badge is obtained and designated as a replacement for the control badge submitted for analysis.

11. Pregnant Workers:

11.1. Medical Providers and Supervisors. Refer pregnant workers, whose duties involve exposure to ionizing radiation, to Bioenvironmental Engineering for counseling and additional actions as may be appropriate. Civilian pregnant workers, not followed by Air Force medical providers, should report directly to Bioenvironmental Engineering.

11.2. Base RSO. The base RSO, upon notification, evaluates the exposure potential for each pregnant worker and advises on protective measures to be taken to protect the mother and fetus.

12. Review of Plans for Modifications and New Facilities. The base RSO must review all plans and specifications for modification of facilities that involve the use of radioactive material or radiation producing devices, to ensure that ALARA is considered. The review will be conducted during Bioenvironmental Engineering's normal engineering review procedure.

13. Radiation Safety Training. The base RSO will approve training lesson plans for employees exposed to radiation sources. Initial training will be conducted before, or as soon as possible after, assignment to work areas involving radiation exposure. Annual refresher training will be conducted to reemphasize and reinforce training objectives. Initial and annual refresher training may be accomplished by a SGPB representative, the functional area RSO, or designated safety representative approved by SGPB. The level of training should be tailored to the specific category of personnel and the hazard presented. The respective functional area RSO will maintain documentation of the training locally and a copy will be forwarded to the Bioenvironmental Engineering Section for inclusion in Tab E of the industrial case file or entry into an approved training tracking program or system. Such training shall, as a minimum, include instructions in the following areas.

13.1. Risk from radiation exposure.

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

13.3. Maximum permissible dose limits.

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

13.5. ALARA philosophy and practice.

14. Adopted Forms:

AF847, *Recommendation for Change of Publication*

AF190, *Occupational Illness/Injury Report*

AFTO115, *Digital/Personal (DAD or PAD) Aalarming Dosimeter Results Log*

AFTO125, *Industrial Radiography Utilization Log*

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Commander

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFI 40-201, *Managing Radioactive Materials in the US Air Force*, 13 April 2007

AFI48-148, *Ionizing Radiation Protection*, 12 October 2001

AFOSH Std, *Laser Radiation Protection Program*, 10 December 1999

ALARA- *As Low As Reasonably Achievable*

AFI- *Air Force Instruction*

AFPD- *Air Force Policy Directive*

AW- *Airlift Wing*

BOS- *Base Operating Services*

EOD- *Explosive Ordinance Disposal*

IEX- *Individual Exemption Codes*

MOC- *Maintenance Operations Center*

mR- *milliroentgen*

OSI- *Office of Special Investigation*

RAM- *Radioactive Material*

REM- *Roentgen Equivalent Man*

RIC- *Radioisotope Committee*

RF- *Radio frequency*

RFR- *Radio Frequency Radiation*

RSO- *Radiation Safety Officer*

Sv- *Sievert*

TMO-*Traffic Management Office*

Terms

Adopted Form—A form used (required) in a publication other than the prescribing publication.

Approval Authority—Senior leader responsible for contributing to and implementing policies and guidance/procedures pertaining to his/her functional area(s) (e.g., heads of functional two-letter offices).

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Certifying Official—A minimum of one organizational level above the OPR, this individual certified the need for the publication, to include currency of information, applicability to the Air Force, and propriety of content.

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Mandatory Coordination—Required review by selected offices prior to publication. Mandatory coordinators review draft publications for specific functional and/or legal purposes.

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Publication—An officially produced, published, and distributed document issued for compliance, implementation, and or information. Includes Policy and Guidance Memorandums.

Publications/form Manager—One who supervises and manages the local publications and/or the forms programs. Is the primary focal point for publication and distribution issues.

Records Disposition Schedule (RDS)—The official schedule that authorizes/governs the disposition of Air Force records, which contains National Archives and Records Administration (NARA) approval authority.

Records Management—The planning, controlling, directing, organizing, training, promoting, and any other managerial activity related to records creation, records maintenance and use, and records disposition for the sake of achieving adequate and proper documentation of the policies and transactions of the Federal Government and effective economical management of agency operations.

Records Maintenance and Use—Any activity involving the location, storage, retrieval, or handling of records kept at office file locations by or for the Air Force.

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