



Department of the Air Force  
HQ AEDC (AFMC)  
Arnold AFB, TN 37389

## Safety, Health, and Environmental Standard

**Title:** IONIZING RADIATION

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**Releasability:** There are no releasability restrictions on this publication.

The provisions and requirements of this standard are mandatory for use by all personnel engaged in work tasks necessary to fulfill the AEDC mission. Please contact your safety, industrial health and/or environmental representative for clarification or questions regarding this standard.

Approved:

Contractor/ATA Director  
Safety, Health and Environmental

Air Force Functional Chief

**Record of Review/Revision**

(Current revisions are highlighted in yellow and marked with a vertical line in the right margin.)

Date/POC	Description
01/17/14 C. Bidmead	Three-year review completed. Updated references. Added requirement for Master Radiation Exposure Registry under paragraph 4.1.4. Updated Annex A "Notice to Employees." Administrative changes throughout: "Base" operating contractor; "Safety, Health and Environmental."
01/25/13	Added NFAC supplement; no other change.
01/25/11 C. Bidmead	Further emphasized that the AEDC BEE maintains authority over the program in definition of RSO. Reworded paragraph 4.2.2.12 to reflect requirement to coordinate requests with AEDC/TSD-SG. Added statement on required coordination in Annex C, step 4.
11/29/10 C. Bidmead	Added note to "Radiation Safety Officer" definition; added requirement for AEDC RSO to coordinate RAM and RPD requests to the BEE in paragraph 4.2.2.12; added: "ANNEX C – APPROVAL PROCESS TO BRING RAM OR RPD ON BASE."
09/13/10 C. Bidmead	Reformatted: Moved statements driving requirements or responsibilities from Paragraph "3.0 DEFINITIONS" to the appropriate locations within this standard. Added requirement for written approval before bringing radioactive materials or radiation producing devices on to AEDC property in 4.1.1. Added requirement to appoint a URSO in writing in 4.2.1. Added individual responsibilities of all personnel in Paragraph 4.2.10. Corrected an error in the RSO approval routing code in 4.2.1.4. Made minor edits for consistency with AFIs and SRPAR throughout document.
09/12/08 R. Jones	Inserted Section 4.1.1 to discuss general requirement to coordinate all use of radioactive materials or devices through the AEDC RSO. Edited Section 4.1.10 to reflect new disposal options through the Air Force. Replaced Section 4.3.1 (General Training) with the general training requirement section detailed in AFI 48-148 to ensure consistency with USAF policy. Added AFI 40-201 and AFI 48-148 as references in Section 5.0. Replaced Annex A with latest State of Tennessee Notice to Employees regarding State Regulations for Protection against Radiation.
04/20/06 R. Jones	General revision and reformatting; read entire document.
11/20/97	Previous Publication/Effective Date



# Safety, Health and Environmental Standard

## IONIZING RADIATION

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## 1.0 INTRODUCTION/SCOPE/APPLICABILITY

**1.1 Introduction** - This standard establishes the acceptable safe practices for possession and use of all sources of ionizing radiation at AEDC. AEDC is not an “exclusive federal jurisdiction base,” and therefore must comply with the requirements of the Tennessee Department of Environment and Conservation, Division of Radiological Health.

**1.2 Scope** – This standard implements the requirements of the State Regulations for Protection against Radiation (SRPAR) and applicable Air Force Instructions. Acquisition, transport, possession, use and disposal of radioactive materials and radiation producing devices on AEDC must be in accordance with this standard, SRPAR, and Air Force directives. If conflicts arise between Air Force directives and State regulations, the state regulations take precedence. This standard does not cover non-ionizing radiation.

**1.3 Applicability** – This standard applies to Department of Defense (DoD) personnel, and civilian contractors who bring and/or use radioactive materials or radiation producing devices on any AEDC owned or leased property.

## 2.0 BASIC HAZARDS/HUMAN FACTORS

Ionizing radiation cannot be detected by the human senses. Radiation can produce bodily injury ranging from local skin damage to death. A single high (acute) exposure to radiation produces serious injury, sickness, or death. Extended exposure to smaller amounts (chronic) may result in cancer. Therefore, great care must be taken to ensure that exposure is As Low as Reasonably Achievable (ALARA).

## 3.0 DEFINITIONS

Accelerator – Any radiation producing device capable of producing x-rays of 0.9 MeV (million electron volts) or greater energy, or other devices capable of discharging nuclear particles in a medium external to the accelerating device.

ALARA – Acronym for “as low as is reasonably achievable” means making every reasonable effort to maintain exposures to radiation as far below applicable dose limits as is practical, consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations and in relation to utilization of nuclear energy, radioactive materials, and ionizing radiation in the public interest.

Base Operating Contractor – A base contractor directly accountable to the Air Force for the AEDC mission.

Becquerel (Bq) – One becquerel is one disintegration per second.

Curie (Ci) – The basic unit used to describe the intensity of radioactivity from radioactive material. One curie is equal to 37 billion disintegrations per second or 37 billion becquerels.

Declared Pregnant Woman – A pregnant woman who voluntarily declares her pregnancy in writing to her employer to initiate procedures that will limit the radiation dose to the embryo/fetus to a lower level.

Exempt Quantities – Radioactive materials having no state or federal licensing requirements because of the quantity of material possessed.

Generally Licensed Materials – Materials that can be traced to a specific license that calls for distribution to general licensees. The specific license is usually held by the manufacturer or distributor of the product. General licenses are automatically issued; however, the licensee must meet requirements in the state regulations and conditions of the general license.

Gray (Gy) – The International System of Units (SI) unit of absorbed dose equal to 100 rads or one joule per kg.

Intervention – An activity that is not part of a controlled practice and is intended to reduce or mitigate sources of existing exposure; actions that save life or limb or mitigate threats greater than that posed by radiation; or those that are done to achieve higher objectives, including those of national security.

Ionizing Radiation – Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, by interaction with matter.

Planned Special Exposure – A planned, infrequent exposure to radiation under limitations of the state regulations, separate from and in addition to the annual dose limits.

**This is an uncontrolled document when printed.**

Rad (radiation absorbed dose) – The unit of absorbed dose of ionizing radiation. One rad is the absorption of 100 ergs of radiation energy per gram of absorbing material.

Radiation – For the purpose of this standard, ionizing radiation.

Radiation Producing Device (RPD) – Any device capable of producing radiation without the use of radioactive material. Radiation producing devices are classified in the State Regulations for Protection Against Radiation (SRPAR) as follows:

- Class I: Dental Radiation Machines
- Class II: Priority Two Medical Radiation Machines
- Class III: Priority One Medical Radiation Machines
- Class IV: Therapy Medical Radiation Machines
- Class V: Priority Two Industrial and Educational Radiation Machines
- Class VI: Priority One Industrial and Educational Radiation Machines
- Class VII: Accelerators

Radiation Safety Officer (RSO) – The person within an organization responsible for the safe use of radioactive materials or radiation producing devices as well as regulatory compliance. On AEDC the following RSO designations are used:

Installation Radiation Safety Officer (AEDC RSO) – Individual(s) designated to oversee the AEDC radiation protection program.

**Note:** The Base Bioenvironmental Engineer (BEE) maintains authority over the program.

Unit Radiation Safety Officer (URSO) – An individual designated to oversee the safe use of radioactive materials and/or radiation producing devices within their organization. This designation is normally synonymous with a state “Licensed RSO” or an Air Force “Permit RSO,” but may also include any person appointed by their supervisor in writing.

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.

Radiography – Examination of the structure or position of materials by nondestructive methods using radiation and a recording medium such as x-ray sensitive film or intensifying screens.

Rem (roentgen equivalent man) – A measure of the dose of any radiation to the body tissue in terms of its estimated biological effects relative to an exposure of one roentgen of x-rays.

Restricted Area – Any area in which specific protective measures are or could be required for controlling routine radiation exposures, preventing access to radiation sources, or preventing the spread of contamination during normal work practices. This includes any area where radiation levels could result in an individual receiving a dose equivalent in excess of 0.02 mSv (2 mrem ) in 1 hour, or 1 mSv (100 mrem) in a year as a result of operations on AEDC.

Radiation Area – A Restricted Area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 mSv (0.005 rem ) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

High Radiation Area – A Restricted Area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

Very High Radiation Area – A Restricted Area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 500 5 Gray (500 rads) in 1 hour at 1 meter from the source of radiation.

Roentgen – A unit of exposure which is a measure of the ionization produced in air by x or gamma radiation. It is the amount of gamma or x-rays required to produce ions carrying one electrostatic unit of electrical charge (either positive or negative) in one cubic centimeter of dry air at standard conditions.

**Note:** The roentgen, rem, and rad are approximately equal when dealing with x-rays and gamma rays.

Sealed Source – Radioactive material permanently bonded or fixed in a capsule or matrix designed to prevent release or dispersal under the most severe conditions of normal use and handling.

Sievert (Sv) – The International System of Units (SI) unit of dose equivalent equal to 1 Joule/kilogram. The sievert is equal to one Gray multiplied by a quality factor. It is a measure of dose equivalent from various types of ionizing radiation. The quality factor for x-rays, gamma rays or beta radiation is one (1). [1 Sievert (Sv) = 100 rems.]

Specifically Licensed Materials – Materials requiring a formal license from the Nuclear Regulatory Commission (NRC) or an agreement state (Tennessee is an agreement state) before the material can be acquired.

State Rules for Protection Against Radiation (SRPAR) – Mandatory rules established by the Tennessee Department of Conservation & Energy, Division of Radiological Health (DRH), and are applicable on AEDC.

**Note:** AEDC is not an area of exclusive federal jurisdiction.

Survey – An evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of ionizing radiation from radioactive materials or radiation producing devices. Such an evaluation includes a physical survey of the location of equipment and materials, as well as measurements of radiation levels or concentrations of radioactive material present as a result of the use of such devices.

## 4.0 REQUIREMENTS/RESPONSIBILITIES

### 4.1 Requirements

**4.1.1 Using Radioactive Material (RAM) or Radiation Producing Devices (RPD) at AEDC** - All use of radioactive material or radiation producing devices must be approved in writing by AEDC RSO prior to bringing the material or device on the installation. This includes outside contractors, vendors, test customers, or anyone else who intends to bring radioactive material or radiation producing devices on site. See Annex C.

4.1.1.1 For items requiring a specific license through the NRC or Agreement State, the authorized user must provide the following documentation to the AEDC RSO:

4.1.1.1.1 A copy of the RAM license

4.1.1.1.2 A copy or sufficient evidence of a Radiation Safety Program that meets requirements of this standard and the SRPAR.

4.1.1.1.3 A current source certificate

4.1.1.1.4 Proof of a current leak test

4.1.1.1.5 Supporting calculations and surveys verifying the proper use of radioactive materials or radiation producing devices while on site

4.1.1.1.6 The specific use, location, time, and duration while on site

4.1.1.2 Notification must be given to the Operations Center (454-7688), Master Work Permit Issuing Official, and respective area supervisors when radioactive materials or radiation producing devices will be used. This notification must list the specific location and approximate time and duration of use.

4.1.1.3 Posting and labeling where applicable must be established in accordance with Section 4.1.5 of this standard.

4.1.1.4 Prior to use, the area must be completely evacuated within the established restricted area and verified by physical walk through or line of sight monitoring. Verbal warnings must also be made where possible (i.e., local public address system)

**4.1.2. Permissible Radiation Exposure in Unrestricted Areas**

4.1.2.1 Operations on AEDC shall be conducted in a manner so that the dose in all unrestricted areas will not exceed 0.002 rem (0.02 mSv) in any one hour, or 0.1 rem (1 mSv) in a year, occupancy and use factors being taken into account.

**4.1.3 Permissible Radiation Exposure in Restricted Areas**

4.1.3.1 Unauthorized personnel must not be allowed in restricted areas.

4.1.3.2 Radiation exposure must be kept ALARA (*As Low As Reasonably Achievable*) according to Federal regulations.

4.1.3.3 Exposure of personnel to radiation must not exceed maximum limits and must be investigated at ALARA action levels shown in table 4.1.

4.1.3.3.1 If a person receives one-tenth or more of the maximum exposure limit (Action Level 1), his work practices are reviewed by his supervisor, and action necessary to reduce his exposure is established and documented. A report of findings and actions is provided to the URSO and the AEDC RSO

4.1.3.3.2 If a person receives one-fifth or more of the maximum exposure (Action Level 2), the URSO and AEDC RSO investigate to determine the cause and recommend corrective action. A report of findings and corrective action is provided to the employee, supervisor, manager of the organization, and the local AF Bioenvironmental Engineer.

	<u>Rem Per Year Maximum Limits</u>	<u>Quarterly ALARA Action Level 1 (Rem)</u>	<u>Quarterly ALARA Action Level 2 (Rem)</u>
Total Effective Dose Equivalent	5.0	0.125	0.250
Eye Dose Equivalent	15.0	0.375	0.75
Shallow Dose to the Skin or Any Extremity	50	1.25	2.5
	<u>Rem Per Term Maximum Limits</u>	<u>Monthly Exposure</u>	
Dose to an Embryo/Fetus of a “Declared Pregnant Woman”	0.5	Avoid substantial variation above a uniform monthly exposure rate.	

**Table 4.1****4.1.4 Personnel Monitoring (Personal Dosimetry)**

4.1.4.1 Persons who are authorized to enter restricted areas must be provided with personnel-monitoring devices; unless it has been determined by the AEDC RSO that they will not be exposed to more than 10 percent (5 percent if less than 18 years of age) of the annual radiation levels specified in Section 4.1.3 of this standard.

4.1.4.1.1 Film badges, Thermoluminescent dosimeters (TLDs), or Optically Stimulated Luminescent dosimeters (OSLDs) are considered as acceptable personal dosimetry devices for permanent record keeping.

4.1.4.1.2 AF personnel (active duty and DAFC) must be entered into the USAF Master Radiation Exposure Registry (MRER) per AFMAN 48-125.

4.1.4.1.3 Pocket dosimeters are used to monitor accumulated dose, and do not satisfy the requirement for a personnel-monitoring device.

4.1.4.2 Personal dosimetry devices must be worn in the whole body area, and shall be worn between the neck and waist, outside of clothing, on the side of the body with greatest potential for exposure, and with the front of the dosimeter facing away from the body.

4.1.4.2.1 Particular attention should be made to collimated beams from radiation producing devices and placement should be in the whole body area of maximum exposure.

- 4.1.4.2.2 If extremities are subjected to higher exposure, additional personnel-monitoring devices are required in addition to whole body monitoring as determined by the AEDC RSO.
- 4.1.4.3 Person(s) entering high radiation areas or performing industrial radiography are required to wear, a pocket dosimeter in addition to their personnel-monitoring device.
  - 4.1.4.3.1 A personal audible warning device is also required unless an audible area radiation-warning device is present.
  - 4.1.4.3.2 Under no circumstances is a person allowed to enter a high radiation area without proper dosimetry.
- 4.1.4.4 Persons entering a restricted area on a temporary and/or infrequent basis must be supplied with pocket dosimeters regardless of the exception cited in Paragraph 4.1.4.1. This requirement applies to AEDC employees and visitors.
- 4.1.4.5 Pocket dosimeter readings must be recorded either daily or when the person completes the task and leaves the restricted area prior to the end of the day. The readings must be recorded and a copy of the records maintained by the URSO for review. The record must give the name of the person, the organization represented, and the date. Dosimeters must be zeroed at the beginning of each shift or when issued.
- 4.1.4.6 Pocket dosimeters should be read frequently inside the restricted area to monitor accumulated dose.
- 4.1.4.7 Special permission must be obtained from the AEDC RSO if temporary monitoring by pocket dosimeters will continue beyond 30 days.
- 4.1.4.8 Permanent exposure records are maintained by base operating contractor Safety, Health and Environmental. Annual exposure reports are distributed to each monitored employee and placed in their medical records.
- 4.1.4.9 Off base employment resulting in potential radiation exposure to monitored employees must be disclosed in writing. Verification of off base exposure to radiation or lack thereof must be documented at least annually.
- 4.1.4.10 Personnel must meet the training requirements of Section 5.0 prior to being issued a personnel-monitoring device. Base operating contractor Safety, Health and Environmental issues personnel monitoring devices.
- 4.1.4.11 Base operating contractor Safety, Health and Environmental on a monthly or quarterly basis issues personnel monitoring devices. A control badge is maintained at all times. The frequency of issuance is determined by the potential for exposure as determined by the AEDC RSO.
- 4.1.4.12 Monitored personnel who become pregnant are encouraged to declare their pregnancy by reporting it to the AEDC RSO. The accumulated dose will be monitored monthly by the AEDC RSO and documented.
- 4.1.4.13 Abnormal exposures must be investigated and documented on a case-by-case basis by the AEDC RSO.
- 4.1.4.14 Overexposure or potential overexposures must be immediately reported to the AEDC RSO who will investigate and document the incident. Personnel monitoring devices will be immediately collected and processed. Notification will be made to management, the local AF Bioenvironmental Engineer, and the appropriate state authority as required by the State Regulations.

#### 4.1.5 Posting and Labeling

- 4.1.5.1 Form RHS 8-3, Notice to Employees, as adapted, must be conspicuously posted where employees work. The lower portion of the form must be completed, identifying the location where the specified documents may be examined. See Annex A.
- 4.1.5.2 Restricted areas as defined in this standard must:
  - 4.1.5.2.1 Be delineated appropriately through engineered and physical controls, signage and/or administrative controls, as appropriate.
  - 4.1.5.2.2 Have access controlled so that only personnel having approval of the URSO or AEDC RSO are permitted unescorted access. Visitors and other personnel entering restricted areas shall be escorted.
- 4.1.5.3 Radiation areas as defined in this standard must:
  - 4.1.5.3.1 Be considered and treated as restricted areas.

- 4.1.5.3.2 Be conspicuously posted with a sign that includes a magenta or black radiation symbol on a yellow background and the words "Caution, Radiation Area," with the exception of medical x-ray facilities and rooms otherwise excepted by the SRPAR. (See Safety, Health and Environmental Standard B3, Control of Hazardous Areas Using Safety Signs, Tags and Barricades.)
- 4.1.5.4 High radiation areas as defined in this standard must:
  - 4.1.5.4.1 Be considered and treated as restricted areas.
  - 4.1.5.4.2 Be conspicuously posted with a sign that includes a magenta or black radiation symbol on a yellow background and the words "Caution, High Radiation Area", with the exception of medical x-ray facilities, and rooms otherwise excepted by the SRPAR
  - 4.1.5.4.3 Adhere to the requirements of the SRPAR Chapter 0400-20-05-.80.
- 4.1.5.5 Very high radiation areas as defined in this standard must:
  - 4.1.5.5.1 Be considered and treated as restricted areas.
  - 4.1.5.5.2 Be conspicuously posted with a sign that includes a magenta or black radiation symbol on a yellow background and the words "Grave Danger, Very High Radiation Area."
  - 4.1.5.5.3 Adhere to the requirements of the SRPAR Chapter 0400-20-05-.81.
- 4.1.5.6 Do not establish high radiation areas with survey meters; use calculation estimates.
- 4.1.5.7 Rooms and cabinets, where radioactive materials are used or stored in quantities exceeding 100 times the quantity specified in schedule RHS 8-2 for natural uranium or thorium and 10 times the quantity specified in RHS 8-2 for radioactive materials, are to be conspicuously posted with a sign bearing the radiation caution symbol and the words:

**CAUTION  
RADIOACTIVE MATERIAL**

- 4.1.5.8 Containers in which radioactive materials are stored must have labels (AFTO 9B, Radioactive Material Warning) bearing the information described above and the following:
  - NOTIFY SECURITY POLICE OR CIVIL AUTHORITIES IF FOUND
  - MANUFACTURER \_\_\_\_\_
  - CHEMICAL SYMBOL/ATOMIC DATE \_\_\_\_\_
  - ASSAY DATE \_\_\_\_\_
  - SERIAL NO. \_\_\_\_\_
  - MODEL NO. \_\_\_\_\_

Quantities must be specified in curies.

- 4.1.5.9 Radiation producing devices must be clearly labeled as follows at the head and at the control panel near the switch that energizes the equipment:

**CAUTION – RADIATION  
THIS EQUIPMENT  
PRODUCES RADIATION  
WHEN ENERGIZED**

- 4.1.6 **Storage of Radioactive Material** - At all times, radioactive materials and devices containing radioactive materials must be:
  - 4.1.6.1 Stored in a secure, locked area specifically designated for storage of these materials, free from handling or tampering by unauthorized individuals.
  - 4.1.6.2 In the possession of an individual properly authorized to handle the materials.

- 4.1.6.3 Installed for use.
- 4.1.7 Written Procedures** – Operating and emergency procedures must be developed for all uses of RAM or RPD by the using organization.
- 4.1.7.1 The procedures must be reviewed by the AEDC RSO and must include items specified in SRPAR Chapter 0400-20-08-.05(2).
- 4.1.7.2 Operating and emergency procedures must be available at the control panel of each accelerator.
- 4.1.8 Leak Testing** – Instruments that contain radioisotopes covered by a state license must be leak tested every six months, unless otherwise required by a specific radioactive materials license, and records must be maintained.
- 4.1.9 Disposal** – Disposal of radioactive materials or devices must be arranged through the AEDC RSO. The AEDC RSO must coordinate disposal efforts through the Air Force radioactive materials waste office [AFIOH/SDRH (AFRMWO)], 2350 Gillingham Drive, Brooks City-Base, TX 78235-5103. If the materials are recyclable an alternate method of disposal is thru the Air Force Radioactive Recycling and Disposal program (AFRRAD), Environmental Management Division, 88 ABW/CEVO, 5490 Pearson Road, Wright Patterson AFB, OH 45433-5332.
- 4.1.9.1 The Air Force holds a contract with a disposal company and must be contacted through the AEDC RSO for allotments, shipping dates, etc.
- 4.1.9.2 Waste material containers prepared for disposal must be free of external contamination and must be surveyed in accordance with Section 6.3 of this standard. This information is documented on shipping documents or attached survey by a qualified person. Supply is responsible for weighing, labeling, and shipping the material. These efforts must be coordinated with the AEDC RSO.
- 4.1.10 Incident Reporting** (Accidents, Overexposures or Thefts) – Accidents, incidents, and thefts involving RAM or RPD must be immediately reported to the AEDC RSO, the AF Bioenvironmental Engineer, State authorities as required by SRPAR and AF Force officials as required by AFI 48-148.
- 4.1.10.1 Report all incidents to the AEDC RSO and the Operations Center immediately.
- 4.1.10.2 When overexposure is suspected, transport the employee to the Dispensary and provide all affected employees' personal dosimetry badge(s) to base operating contractor Safety, Health and Environmental for an emergency dose assessment. Work shall not resume until a dose assessment has been made and employees have the required dosimetry badges.
- 4.1.10.3 Secure the area against personnel exposure and/or tampering until the incident has been investigated and hazards have been mitigated.
- 4.1.10.4 Report suspected thefts to management and Security.
- 4.1.11 Inventories** – Radioactive materials and radiation producing devices must be inventoried annually by the contractors, unless otherwise required by individual license/registration Inventories must be updated immediately to show changes in the status of radiation producing devices or radioactive materials.
- 4.1.12 Utilization Logs** – Radiography utilization logs must document each use of the machine or device along with the information required by the state regulations, registration, or license. These logs are maintained by the using organization.
- 4.1.13 Procurement, Licenses and Registrations** – The purchase or introduction of new sources of ionizing radiation at AEDC, including devices or test articles containing radioactive materials, must be coordinated with the AEDC RSO. The person who is responsible for the radiation source is responsible for complying with all applicable requirements of SRPAR and with the provisions of applicable licenses and registrations.
- 4.1.13.1 Radioactive Materials Requiring a Specific License:
- 4.1.13.1.1 Copies of the Tennessee license application, radioactive materials license, and relative correspondence must be supplied to the AEDC RSO and the AF Bioenvironmental Engineer.

- 4.1.13.1.2 All radioactive material supplied by the Air Force to a contractor must have a “contractor specific” license for the contractor to legally possess it. This may include materials which might otherwise be exempt from license requirement.
- 4.1.13.2 Radioactive Materials Requiring a General License - Licensing and registration documents or applications must be provided to the AEDC RSO and the AF Bioenvironmental Engineer.
- 4.1.13.3 Registration of Radiation Producing Devices - There are two types of Tennessee Department of Environment and Conservation registrations: X-ray registrations and certified registrations. The possessor in both cases is required to file within 10 days of receipt of the equipment.
- 4.1.13.3.1 X-ray Registration: This applies to x-ray producing devices operating below 0.9 MeV and is accomplished by completing the appropriate Forms RHS 8-4, 8-4a, or 8-4b, Requisition of X-ray Producing Equipment, and filing with the Tennessee Department of Environment and Conservation thru the AEDC RSO. X-ray equipment registered in this category may be activated immediately.
- 4.1.13.3.2 Certified Registration: This applies to accelerators (particle accelerators and x-ray producing devices at or above 0.9 MeV) and is accomplished by completing Form RHS 8-8, Application for Certified Registration, and submitting it to the Tennessee Department of Environment and Conservation thru the AEDC RSO within 10 days for approval. This equipment cannot be operated until a certified registration has been granted.

## 4.2 RESPONSIBILITIES

### 4.2.1 Using Organization shall:

- 4.2.1.1 Organizations possessing or using Radioactive Materials (RAM) or Radiation Producing Devices (RPD) on AEDC shall appoint a URSO in writing and forward a copy of the appointment letter to the AEDC RSO initially and whenever changes occur. The appointment letter must be kept current.
- 4.2.1.2 Coordinate all changes to the unit radiation protection program, material licenses, or device registrations with the AEDC RSO in advance. This includes but is not limited to:
- 4.2.1.2.1 Plans and procedures for new uses of RAM or RPD.
- 4.2.1.2.2 Requisitions for materials or services involving RAM or RPD.
- 4.2.1.2.3 Plans to relocate, remove, excess, scrap, or transfer ownership of any AEDC owned RAM or RPD
- 4.2.1.3 Determine the need for environmental assessment in accordance with AEDC Safety, Health and Environmental Standard A8, Environmental Impact Analysis Process.
- 4.2.1.4 Submit requisitions for desired material or device in the AEDC Computerized Maintenance Management System.
- 4.2.1.5 Notify the AEDC RSO of the expected delivery date and actual delivery date upon receipt.
- Note:** Radiation producing devices must be registered with the State within ten (10) days of acquisition. Accelerators shall not be energized until registration is certified by the State in writing.
- 4.2.1.6 Request written approval through the AEDC RSO prior to allowing anyone (visitor, vendor, contractor, etc.) to bring RAM or RPD on to AEDC property. See Annex C.
- 4.2.1.7 Ensure that all personnel receive radiation safety training as required in Section 5.0 of this standard.
- 4.2.1.8 Ensure that all personnel wear assigned dosimetry.
- 4.2.1.9 Survey operations as required in Section 6.0 of this standard.
- 4.2.1.10 Conduct an inventory of ionizing radiation sources as specified in Section 4.1.11 of this standard. Provide copies of the inventory to their Safety Office and to the AEDC RSO. Maintain records as required by regulations.
- 4.2.1.11 Ensure required leak tests on instruments and sensors that contain radioactive materials are performed as specified in Section 4.1.8 of this standard.

**Note:** Leak test guidance may be obtained through base operating contractor Safety, Health and Environmental.

- 4.2.1.12 Notify the AEDC RSO of the need to dispose of, transfer or ship radioactive material and request instructions.
- 4.2.1.13 Immediately notify the AEDC RSO whenever an accident, overexposure, or theft is suspected and implement the requirements in Section 4.1.10 of this standard.
- 4.2.1.14 Investigate incidents as coordinated thru the AEDC RSO, prepare the necessary reports, and forward a copy to the AEDC RSO.
- 4.2.1.15 Hand-carry the employee dosimetry badges to base operating contractor Safety, Health and Environmental immediately following any suspected overexposure. Work shall not resume until a dose assessment has been made by the AEDC RSO.
- 4.2.1.16 Secure the room or area where an incident or theft may have occurred in accordance with AEDC Security Regulations.
- 4.2.1.17 Notify Security of suspected theft.

#### **4.2.2 AEDC RSO shall:**

- 4.2.2.1 Review plans and procedures, provide consultation, and make recommendations on licensing or registration requirements.
- 4.2.2.2 Complete licensing or registration forms for submittal to the State authorities.
- 4.2.2.3 Arrange for purchase, delivery, and pickup of personnel-monitoring devices and forward exposure reports to monitored personnel.
- 4.2.2.4 Provide radiation safety training to AEDC employees when requested through the base operating contractor training coordinators.
- 4.2.2.5 Formulate policy with regard to radiation safety and keeps the Commander and the base operating contractor management informed about radiation health and safety issues and effectiveness of measures to control radiation hazards.
- 4.2.2.6 Provide consultation on all radiation safety issues.
- 4.2.2.7 Review installations and procedures before use.
- 4.2.2.8 Survey radiation operations for compliance with this standard and state regulation.
- 4.2.2.9 Inspect and surveys outgoing shipments as required.
- 4.2.2.10 Notify the state authorities of disposal, transfer, or loan of radiation producing devices in accordance with SRPAR.
- 4.2.2.11 Assist in incident evaluation, provide consultation, perform dose assessments, review subsequent reports, make recommendations as necessary, ensure dosimetry is sent for processing within 24 hours if radiation exposure cannot be ruled out, and notify appropriate personnel as required by SRPAR Chapter 0400-20-05. See Annex B for unit conversion factors.
- 4.2.2.12 Review all requests to bring RAM or RPD on to AEDC property, and will coordinate the requests with AEDC/BEE for approval.

#### **4.2.3 Unit RSO (URSO) shall:**

- 4.2.3.1 Complete all required RAM licensing forms or packages, and provide a copy to the AEDC RSO for submittal to the State authorities.
- 4.2.3.2 Provide the AEDC RSO with all required information needed to register RPDs, and notify the AEDC RSO when a change to the equipment status occurs is needed.
- 4.2.3.3 Provide a copy of the state-approved license to the AEDC RSO.
- 4.2.3.4 Ensure the requirements of this standard and the SRPAR are followed.

4.2.3.5 Develop emergency procedures in accordance with Paragraph 4.1.7.

**4.2.4 Materials Management shall:**

Notify the AEDC RSO upon receipt of sources of ionizing radiation.

**4.2.5 Construction/Project Management Organization shall:**

Ensure coordination of any operation that requires the use of RAM or RPD is made as specified in Section 4.1.1.

**4.2.6 Precision Measurement Equipment Laboratory (PMEL) shall:**

4.2.6.1 Perform maintenance of instruments and sensors that contain radioactive materials.

4.2.6.2 Perform calibrations of survey instruments as specified in Section 6.4 of this standard.

**4.2.7 Base Operating Contractor Safety, Health and Environmental shall:**

4.2.7.1 Maintain the personnel monitoring/dosimetry program, issue personnel monitoring devices, and review dosimeter records.

4.2.7.2 Annually provide monitored employees with a copy of their radiation exposure report and documents any off base radiation exposure or lack thereof.

4.2.7.3 Verify that employees entered into the monitoring program have received training as required in Section 5.0 before issuing badges.

**4.2.8 Base Operating Contractor Occupational Health shall:**

4.2.8.1 Perform examinations periodically and on request or when overexposure is suspected.

4.2.8.2 Facilitate further medical care of personnel subject to over-exposure when necessary.

4.2.8.3 Report medical findings of suspected or actual overexposure cases in writing to the AEDC RSO, URSO, employee, supervisor, and base operating contractor Safety, Health and Environmental.

**4.2.9 Base Operating Contractor Transportation/Logistics shall:**

4.2.9.1 Prepare outgoing shipments of radioactive material in compliance with U.S. Department of Transportation regulations.

4.2.9.2 Process the prepackaged outgoing shipment in accordance with U.S. Department of Transportation regulations and AFI 40-201, *Managing Radioactive Materials in the US Air Force*.

**4.2.10 AEDC personnel shall:**

4.2.10.1 Report radiological safety hazards or violations of this standard to supervision and the AEDC RSO.

4.2.10.2 Report any transferred or unaccounted for RAM and/or RPD to supervision and the AEDC RSO.

4.2.10.3 Notify the AEDC RSO of any RAM or RPD found unsecured, uncontrolled or abandoned.

4.2.10.4 Complete radiation safety training required in Section 5.0 when applicable.

## 5.0 TRAINING

**5.1** All personnel who have the potential to be occupationally exposed to 10 percent of the annual dose limits specified in 4.1.3 shall receive initial and annual training that is appropriate in breadth and depth to the radiation hazards present in the workplace. Training may include other populations based on the judgment of the AEDC RSO. Training should address the following topics:

5.1.1 Types and characteristics of radiation of concern

5.1.2 Radioactivity, radioactive decay or x-ray production

5.1.3 Modes of exposure – internal versus external

5.1.4 Health risks posed by this exposure including: deterministic and stochastic effects, and somatic and genetic effects and effects on the unborn fetus.

- 5.1.5 General radiation protection principles including:
  - 5.1.5.1 ALARA and dose limits
  - 5.1.5.2 External protection through time, distance, and shielding
  - 5.1.5.3 Internal protection through respiratory protection, protective clothing and hygiene, as appropriate
- 5.1.6 Use of instruments, equipment, and personal dosimetry, as appropriate, to:
  - 5.1.6.1 Identify sources of radiation emission and radioactive contamination
  - 5.1.6.2 Measure radiation exposure rates or dose rates
  - 5.1.6.3 Monitor individual radiation doses
- 5.1.7 Emergency procedures and reporting
- 5.2 Other Required Training** – Individuals working with radiation sources requiring certified registrations or radioactive materials licenses must be instructed in the requirements of this standard and the requirements of the license.
- 5.3 Radiographers** – Persons performing radiography must be trained as specified in the SRPAR and the respective license or registration.
- 5.4 Accelerator Operators** - Persons who operate accelerators must be trained as specified in the SRPAR and the respective license or registration.
- 5.5 Intervention Actions** – persons participating in intervention actions in uncontrolled radiation environments must be informed of the potential health risks and trained in the principles and procedures to minimize their exposure.
- 5.6 Training Records** – Training records must be maintained for three (3) years.

## **6.0 INSPECTIONS/AUDITS/ SURVEYS**

### **6.1 All Areas**

- 6.1.1 Areas where RAM or RPD are used or stored must be surveyed initially and as necessary to evaluate hazards and establish the required controls.
- 6.1.2 All surveys shall include a sketch of the area or article surveyed and the following information shall be included on the survey form:
  - 6.1.2.1 Surveyor name and organization
  - 6.1.2.2 Date and time of survey
  - 6.1.2.3 Survey instrument used including calibration date and type of radiation detected
  - 6.1.2.4 For radiation producing device surveys, the respective operating voltage and amperage should be noted
  - 6.1.2.5 Sufficient detail to identify and characterize the radiation and/or contamination location and dose rate or contamination level. The units should be clearly stated or identified in a legend.
- 6.1.3 Records of surveys must be maintained permanently by the custodial organization with a copy sent to the AEDC RSO.

### **6.2 Industrial Radiography**

- 6.2.1 Radiography operations must be inspected at least quarterly to ensure safe operation. All RAM and RPD will be inspected at least annually by the AEDC RSO or a designee. Class II and V radiation producing devices shall be inspected every two years by an inspector registered with the State of Tennessee. Class VI and VII devices will be inspected annually by an inspector registered with the State of Tennessee.
- 6.2.2 Surveys must be conducted to ensure that the sealed source is fully retracted to its shielded condition or that the radiation from the radiation producing device has terminated. Records must be maintained by the custodial organization.

- 6.2.2.1 A survey will be made of the radiographic exposure device and the guide tube after each exposure when approaching the device or the guide tube. This is a confirmatory survey to verify the source has properly returned to its shielded position.
- 6.2.2.2 A survey of the radiographic exposure device is required any time the source is exchanged and whenever the device is placed in storage to ensure the source is in the shielded position.
- 6.2.2.3 A utilization log will be maintained documenting the radiation level when the exposure device is moved from its storage location and again when secured at the end of the shift. The readings should be compared to each other to verify the source has been properly secured in the exposure device.
- 6.2.2.4 For field radiography, a sketch will be prepared of the radiation area. Calculations are acceptable to set the restricted area boundary, but verification is required if time permits.
- 6.2.2.5 During operation of radiation producing devices (x-ray machines and accelerators); a survey will be made after each exposure prior to entering the exposure room. Additionally, a survey will be made at the tube head after use, before approaching the target area.

### **6.3 Shipping and Receiving Locations**

- 6.3.1 A detailed survey shall be performed prior to receipt of shipment of radioactive material.
- 6.3.2 Type A and limited quantity shipments as defined in 49 CFR 173 should be surveyed within one working day of receipt. All other shipments should be surveyed within 3 hours of receipt at the warehouse. The survey shall include the following:
  - 6.3.2.1 Verification of contents to ensure the shipment contains the items described on the manifest, shipping labels, or other related documents.
  - 6.3.2.2 Inspection of the package to ensure the item is free of damage. If the container is damaged, proceed with caution wearing a lab coat, gloves, and other personal protective equipment as deemed necessary. If package is seriously damaged, contact the AEDC RSO for instructions prior to receipt.
  - 6.3.2.3 Using a Beta/Gamma survey meter, obtain surface reading along the periphery of the package and denote the highest reading. If the dose rate exceeds 0.5 mrem/hr, check with the transportation representative to ensure the dose rate complies with the shipping requirements and shipping label, if attached. These requirements can be found in 49 CFR 173. If requirements are not met, isolate the area around the package to restrict personnel exposure below 2 mrem/hr and contact the AEDC RSO for instructions.
  - 6.3.2.4 Swipe the entire surface of the container, or at least 300 square centimeters along the top, bottom and sides, and count the swipe in a low background area. If the swipe sample exceeds 50 cpm above background isolate the area around the package and contact the AEDC RSO for instructions. Take additional swipe samples of at least 100 square centimeters in the immediate area to ensure the surface contamination is contained inside the boundary. Denote all swipe results on the survey.
  - 6.3.2.5 Provide a copy of the survey to the transportation representative and AEDC RSO.
  - 6.3.2.6 For shipment, contact the transportation representative for assistance with shipping requirements.
  - 6.3.2.7 For receipt, carefully open the package and inspect the inner contents against the manifest or shipping document(s). Internal items may require a survey similar to that described above depending on their observed condition and packaging. Store the material in accordance with Section 4.1.6.

### **6.4 Survey Instrument Calibration**

- 6.4.1 Survey instruments used for industrial radiography must be calibrated at intervals not to exceed six months and following repair or as otherwise stipulated in the license, registration, or manufacturer's instructions, whichever is more limiting. All other survey instruments shall be calibrated annually and following repair.
- 6.4.2 Certificates of calibration shall be maintained for 3 years following calibration.
- 6.4.3 Survey instrument operation shall be validated for proper operation prior to use in accordance with manufacturers guidance.

**7.0 REFERENCES**

AEDC Safety, Health and Environmental Standards

A8, Environmental Impact Analysis Process

B3, Control of Hazardous Areas Using Safety Signs, Tags and Barricades

AFI 40-201 – Managing Radioactive Materials in the US Air Force

AFI 48-148 – Ionizing Radiation Protection

AFMAN 48-125 – Personnel Ionizing Radiation Dosimetry

TN State Rules for Protection against Radiation (SRPAR):

Chapter 0400-20-04, General Provisions

Chapter 0400-20-05, Standards for Protection against Radiation

Chapter 0400-20-06, Use of X-Ray Apparatus

Chapter 0400-20-08, Radiation Safety Requirements for Industrial Radiography

Chapter 0400-20-09, Requirements for Accelerators

Chapter 0400-20-10, Licensing and Registration

**8.0 ANNEXES**

- A. Tennessee Department of Health and Environment Division of Radiological Health Notice to Employees
- B. SI Units and Conversion Factors
- C. Approval Process to Bring RAM or RPD on Base

**9.0 SUPPLEMENT**

NFAC A321-0801-XSP – D11 Ionizing Radiation

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
DIVISION OF RADIOLOGICAL HEALTH

## NOTICE TO EMPLOYEES

In "STATE REGULATIONS FOR PROTECTION AGAINST RADIATION", The Tennessee Department of Environment and Conservation has established standards for your protection against radiation hazards and certain provisions for the option of workers engaged in work under licenses or registrations issued by the Department.

### YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to—

1. Apply these regulations to work under the license or registration. Licenses and Certified Registrations contain special conditions which shall be considered in addition to these regulations.
2. Post or otherwise make available to you a copy of the regulations, licenses, registrations, and operating procedures which apply to work in which you are engaged, and explain their provisions to you.
3. Post any written notice from the Department that the regulations have been violated and response to such notice.

### YOUR RESPONSIBILITY AS A WORKER

You should familiarize yourself with those provisions of the regulations, and the operating procedures which apply to the work in which you are engaged. You should observe their provisions for your own protection and protection of your co-workers.

### AREAS COVERED BY THESE REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels and safety interlock equipment;
5. Exposure records and reports;
6. Option for workers regarding the Department's inspection; and
7. Related matters.

### REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The Department's regulations require that your

employer give you a written report if you receive an exposure in excess of any applicable limit as set forth in the regulations or in the license. The basic limits for exposure to employees are set forth in Rules 0400-20-05-.50, 0400-20-05-.53 and 0400-20-05-.55 of the regulations. These rules specify limits on exposure to radiation and exposure to concentrations of radioactive material in air and water.

2. If you work where personnel monitoring is required and if you request information on your radiation exposures;
  - a. your employer must advise you annually of your exposure to radiation; and
  - b. your employer must give you a written report, following termination of your employment, of your radiation exposures.

### INSPECTIONS

All licensed or registered activities are subject to inspection by representatives of the Department. In addition, any worker or representative of workers who believes that there is a violation of the regulations or the terms of the employer's license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by sending a notice of the alleged violation to the Tennessee Department of Environment and Conservation, Division of Radiological Health, L&C Annex, 3<sup>rd</sup> Floor, 401 Church Street, Nashville, Tennessee 37243-1532. The request must set forth the specific grounds for the notice, and must be signed by the worker or the representative of the workers. During inspections, Department inspectors may confer privately with workers, and any worker may bring to the attention of the inspectors any past or present condition which he believes contributed to or caused any violation as described above.

### POSTING REQUIREMENT:

Copies of this notice must be posted in a sufficient number of places in every establishment where employees are employed in activities registered or licensed pursuant to **Chapter 0400-20-10** to permit employees working in or frequenting any portion of a restricted area to observe a copy on the way to or from their place of employment. **The following documents are available for examination at ATA Radiation Safety Officer's office, Bldg. 1478.**

- State Regulations for Protection Against Radiation
- **RAM** license or documents incorporated into the license by reference and amendments thereto
- Certified Registration or Registration of x-ray producing equipment

**Operating and emergency procedures applicable to licensed or registered activities are available at the controls and electronically.**

## SHE Standard D11 Ionizing Radiation

### ANNEX B SI UNITS AND CONVERSION FACTORS

SI (System International) units are now being used in many countries as the primary measurement system, including measurement of radioactivity, and the system is coming into use in the United States. Many journals now require the use of SI units, and U.S. regulatory agencies are beginning to use SI units as well as conventional units in regulations.

AEDC is seeking to familiarize users of radioactive materials with SI. The SI unit for radioactivity is the becquerel (Bq), and is defined as one nuclear transformation per second. It is a small unit when compared to the curie (Ci), and it is convenient to use multiples of the unit (see listing later in this brochure). It does have the convenience however of relating directly to count rate once corrections have been made for counting efficiency.

Most suppliers of radioactive materials including the National Institute of Standards Technology (NIST-formerly NBS) have been using dual units (curies and becquerels) in catalogs, product literature and labeling for some time and plan to do so for the foreseeable future. **The European Economic Community (EEC) has stated that it will accept only SI units for radioactivity after 1999, and it is anticipated that all suppliers of radioactive products will be using only SI units at that time.** In Canada, Atomic Energy Control Board documents produced since 1985 have been in SI units only, and conversion of regulations is in progress.

Other SI radiation measurement units are as follows:

#### Exposure and Exposure Rate

The roentgen (R) is the traditional unit of measurement for exposure, the charge produced in air by gamma or x-rays. The SI unit of exposure is coulombs per kilogram (C/kg) of air.

$$1 \text{ C/kg} = 3876 \text{ R}$$

$$1 \text{ R} = 2.58\text{E-}4 \text{ C/kg}$$

No special name has been given to this SI unit (C/kg) and since there is no convenient conversion to other SI units, it is seldom used. Instead, the observed dose rate in air, that is the air kerma rate, is typically being used as the SI measurement to replace exposure rate. An example of the use of air kerma rate is to define the radiation output from a sealed radioactive source in SI units. The SI units usually used to express air kerma rate are grays/second. In traditional units, exposure rate from a sealed source has typically been expressed in roentgens/hour at a distance of 1 meter from the source.

Charge as defined in exposure (charge produced in air by gamma and X-radiation) does not include ionization produced by Bremsstrahlung arising from absorption of electrons (beta particles). Apart from this difference, which is significant only with high energy beta particles, exposure is the ionization equivalent of air kerma. For a further discussion of air kerma see ICRU (International Commission on Radiation Units and Measurements) Report 33, 1980.

#### Absorbed Dose

This is the amount of energy imparted to matter, and the rad has been the unit of measurement. The SI unit for absorbed dose is the gray (Gy).

$$1 \text{ Gray (Gy)} = 100 \text{ rad}$$

$$1 \text{ rad} = 0.01 \text{ Gy}$$

One roentgen of X-radiation in the energy range of 0.1-3 MeV produces 0.96 rad in tissue.

#### Dose Equivalent

The dose equivalent is the absorbed dose multiplied by modifying factors such as a quality factor (accounts for the biological effect of different types of radiation) and the dose distribution factor. The rem is the unit of measurement that has been used, and the SI unit is the sievert (Sv).

$$1 \text{ Sv} = 100 \text{ rem}$$

$$1 \text{ rem} = 0.01 \text{ Sv}$$

## SHE Standard D11 Ionizing Radiation

### CONVERSION FACTORS

#### SI Units

- 1 becquerel (Bq) = 1 disintegration/second
- 1 becquerel =  $2.7027\text{E}-11$  curie or about 27 picocuries (pCi)
- To convert becquerels to curies, divide the becquerel figure by  $37\text{E}9$  (alternatively multiply the becquerel figure by  $2.7027\text{E}-11$ )
- 1 curie (Ci) =  $3.7\text{E}10$  disintegrations/second or 37 gigabecquerel (GBq)
- To convert curies to becquerels, multiply the curie figure by  $37\text{E}9$

#### Curie units that are frequently used:

- 1 Curie (Ci) = 1000 mCi
- 1 millicurie (mCi) = 1000 uCi
- 1 microcurie (uCi) = 1000 nCi
- 1 nanocurie (nCi) = 1000 pCi (picocuries)

#### Becquerel units that are frequently used:

- 1 kilobecquerel (kBq) = 1000 Becquerels (Bq)
- 1 megabecquerel (MBq) = 1000 kBq
- 1 gigabecquerel (GBq) = 1000 MBq
- 1 terabecquerel (TBq) = 1000 GBq
- 1 Ci = 37 GBq
- 1 mCi = 37 MBq
- 1 uCi = 37 kBq
- 1 nCi = 37 Bq

Reference: U.S. Council for Energy Awareness, Committee on Radionuclides and Radio-pharmaceuticals

## SHE Standard D11 Ionizing Radiation

### ANNEX C APPROVAL PROCESS TO BRING RAM OR RPD ON BASE

#### How Do We Obtain Written Approval?

**Step 1:** Read this standard and the information in this Annex.

**Step 2:** Ensure the person(s) possessing and using the RAM or RPD is/are properly licensed and trained to safely perform the task. They must have the appropriate TN license or registration.

**Step 3:** Prepare a written request (Email is acceptable). **Include the following information in your request:**

- AEDC POC/Sponsor/Contract Monitor: name, Org, and phone number
- Date of Request
- Licensee/Possessor: name, title, address and phone number
- Type/Qty of material and/or device
- Date(s) and time(s) item(s) will be on site
- Activity to be conducted and the specific location(s)
- Potential impact to other AEDC operations or personnel
- Required documents as appropriate per paragraph 4.1.1.1 of this standard

**Step 4:** Submit your request to the AEDC RSO, who will in turn coordinate the request with AEDC/TSD-SG.

Mr. Chris Bidmead, CSP  
Safety & Health Group  
1478 Fifth St. (MS 7000)  
Arnold AFB, TN 37389-7000

(931) 454-5446  
chris.bidmead@arnold.af.mil

**Step 5:** Wait for written approval before bringing RAM or RPD on base. Maintain a copy of written approval at the work location.

#### What Outside Contractors Need to Know!

- Notify contracting officer or AEDC RSO whenever the use of Radioactive Material (RAM) or Radiation Producing Devices (RPD) is anticipated.
- Licensing/Permitting: AEDC is not an area of exclusive federal jurisdiction. Contractors must hold a valid TN state license for RAM or have currently paid reciprocity to the state.

Failure to obtain approval can result in enforcement action that may include civil penalties.
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- Nature of Operations: Provide information on location, description of use and duration. Specific information describing the type/isotope, qty/activity and intensity of radiation should be included. This enables AEDC to assess impacts to operations, personnel and facilities, and in the event of an accident enables emergency responders to safely conduct operations.
- Health and Safety Plan: These procedures must be followed IAW your federal or state license/permit. Contractors are solely responsible for the safety and health of their employees.
- Risks to AEDC Operations, Personnel, Facilities or Real Estate: Program managers and contractors have a responsibility to immediately contact the contracting officer and AEDC RSO whenever their radioactive items/devices may impact AEDC operations, personnel, facilities or real estate. Once aware of the impacts, the AEDC RSO is responsible for assessing these risks, ensuring compliance, and making appropriate notifications.
- Spot Check/Audit, as required: Spot checks of contractor operations are necessary to enforce AF policy on management and control of RAM on AF installations.

#### What Contract Monitors Need to Know!

- If possible, prior to letting contract, review Purchase Request Package (SOO, SOW, PWS, etc.) and determine whether or not it requires contractors to use RAM or RPDs.
- Provide recommendation to the government contracting officer on whether or not the FAR clause should be included (FAR 52.223-7).

**This is an uncontrolled document when printed.**

### **SHE Standard D11 Ionizing Radiation**

- Include the topic of RAM and RPDs in program reviews, as applicable. Limit the use of RAM and RPDs where feasible, consistent with AF needs.
- Notify the AEDC RSO to obtain written approval prior to allowing any RAM or RPD on AFB.
- Follow requirements of AFI 40-201, AEDC SHE Standard D11, SRPAR and any other restrictions/requirements established by the AEDC RSO.
- Notify the Operations Center and AEDC RSO of any accident, incidents, or unplanned/unapproved operations that occur related to RAM or RPDs.

# A321-0801-XSP- D11 Ionizing Radiation

**Review:** This policy will be reviewed and updated using the same cycle as the AEDC Safety Standard D11 Ionizing Radiation.

**References:** AEDC Safety Standard D11 Ionizing Radiation  
Ames Procedural Requirement APR 8715.1 Chapter 7 – Ames Radiation Safety Guide

**Scope:** This policy implements the requirements of the State Regulations for Protection Against Radiation (OSHA) and applicable Air Force Instructions. Acquisition, transport, possession, use and disposal of radioactive materials and radiation producing devices at NFAC must be in accordance with this supplement, OSHA, and Air Force directives. If conflicts arise between Air Force directives and State regulations take precedence.

**NFAC Worksite Application:** NFAC will follow Ames Procedural Requirement APR 8715.1 Chapter 7 – Ames Radiation Safety Guide.

NFAC only radiation source are the tritium exit signs used throughout the facility. In the event of a sign being damaged the following procedures have been established:

1. Clear the area of all personnel.
  2. Block all access to the area.
  3. Record all the name(s) of personnel that were in the area.
  4. Isolate exposed personnel from the public.
  5. Report the mishap to Safety verbally 24/7.
  6. Contact NASA Dispatch to have the Hazardous Waste Disposal Group to clean/decontaminate the area.
- I. NFAC Site Management shall:
- Ensure that the policy is followed.
- II. NFAC Supervisors and Test Directors shall:
1. Ensure policy is followed.
  2. Ensure that customers, staff, and vendors follow policy.
- III. NFAC Safety Engineer/Management Designee shall:
1. Coordinate that all personnel exposed to the spill will be sent to the Health Unit for required monitoring until medically cleared.
  2. Inform the AEDC OP Center of all reportable spills at NFAC.
  3. Investigate the cause of the damage/spill and institute corrective measures to either eliminate or have interim control measures.
  4. Ensure all radiation material is inventory.
  5. Ensure personnel exposed to possible radiation are tested and treated if necessary.
  6. Ensure personnel are aware of the hazards and procedures.
  7. Report any radiation mishap to AEDC OP Center.
- IV. NFAC Staff shall:
1. Follow the policy.
  2. Not work with any radiation source unless trained.