

**BY ORDER OF THE
INSTALLATION COMMANDER**

**CHARLESTON AIR FORCE BASE
INSTRUCTION 48-2**

24 MAY 2004

Aerospace Medicine

RADIATION PROTECTION PROGRAM



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(Capt Raymond A. Lewis)
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This instruction describes Charleston AFB specific requirements for protection of personnel and their dependents from ionizing or non-ionizing radiation. It applies to all units and personnel working or living on, or attached to, Charleston AFB including military, civilian, contractor, and personnel living in base housing. This instruction implements the “As Low As Reasonably Achievable” (ALARA) concept for control of ionizing radiation. It specifies local management procedures that are required in order for radiation exposures to be kept at a minimum, and to prevent loss of control of radioactive material.

SUMMARY OF REVISIONS

This document is substantially rewritten and reorganized, and it must be completely reviewed. This update allows for unit realignment in accordance with new unit designations and renumbers the instruction to align it with the current series title. A glossary of references, terms and supporting information has also been added; see [Attachment 1](#), for user convenience.

1. Responsibilities:

1.1. Installation Commander:

1.1.1. Appoints an Installation Radiation Safety Officer (RSO). This individual is usually the base Bioenvironmental Engineer, but may be a senior Bioenvironmental Engineering technician with special experience identification 492, or another qualified individual as appropriate.

1.1.2. Ensures that personnel in his or her command comply with applicable protection standards for all ionizing and non-ionizing radiation sources used.

1.2. Unit Commanders:

1.2.1. Appoint a unit RSO in writing, with a copy of the appointment letter provided to the installation RSO (437 ADOS/SGGB).

1.2.2. Ensure personnel in his or her command who receive, distribute, use or dispose of radioactive material or work with radiation producing devices or material (ionizing and non-ionizing) comply with applicable protection standards and the ALARA concept.

1.2.3. Request a radioactive material permit and appoint a permit RSO as required by AFI 40-201, *Managing Radioactive Material in the US Air Force* when the use of radioactive material is necessary.

1.3. Installation RSO:

1.3.1. Administers the Installation Radiation Safety Program by compiling annual inventories, assisting unit RSO's with training and technical questions, monitoring exposures to ionizing radiation with the Thermoluminescent Dosimeter Program, overseeing acquisition and use of sources of ionizing and non-ionizing radiation and investigating abnormal incidents or exposures involving radioactive materials, x-ray, radiofrequency, or laser emitters.

1.3.2. Conducts routine surveillance in all areas where radioactive materials or radiation producing devices are stored or used (exception: sources with a low hazard potential, such as individual electron tubes). Surveillance will be conducted according to AF Radioisotope Committee (RIC) permits and Nuclear Regulatory Commission (NRC) licenses and will follow all AF and federal guidelines. Leak tests of permitted radioactive material will be conducted according to the permit and the results being filed with the permittee and at Bioenvironmental Engineering Office.

1.3.3. Ensures ALARA training is being conducted annually by unit RSOs.

1.3.4. Maintains unit RSO appointment letters and provides information to unit RSOs concerning radiation safety surveys.

1.3.5. Reviews results of personnel Dosimetry monitoring and interprets results as needed. Uses criteria in [Attachment 2](#) to determine if investigations of exposures are needed. Distributes results of monitoring to each monitored area, for individual review.

1.3.6. Serves as the point of contact for CAFB with the AF Radioisotope Committee.

1.3.7. Provides consultation and advice on the personnel hazards associated with radiation and the effectiveness of control measures.

1.3.8. Periodically briefs the Installation Safety Council on radiation protection topics, including receipt of new material and status of base permits. Provides a current listing of the location of radioactive materials to the Base Fire Department and the Civil Engineer Readiness Flight to be used in advising personnel on radiation hazards they may encounter during emergency operations.

1.3.9. Briefs commanders of units with radioactive material permits on the status of the unit radiation protection program annually.

1.3.10. Reviews construction projects and facility designs to ensure radiation safety, and establishes procedures to review and approve contractor use of radioactive material (such as permitted density instruments) prior to use on CAFB.

1.4. Unit RSOs:

1.4.1. Provide initial and annual unit radiation safety training to all affected personnel describing hazards and precautions applicable to radiation (see [Attachment 3](#)). Train users on the radioactive hazards associated with these materials and precautions in place to keep exposure ALARA.

Ensure all persons on the Air Force personnel Dosimetry program receive and follow written guidelines on wear and storage of radiation dosimeters. Maintain records in the unit documenting all radiation safety training received.

1.4.2. Assist the installation RSO by gathering information for annual inventories of ionizing radiation sources (such as radioactive materials and x-ray units) and non-ionizing sources (such as lasers and radiofrequency emitters), and notify the installation RSO whenever new emitters are expected/received.

1.4.3. Contact the installation RSO immediately for any radioactive item that is lost, damaged or leaking.

1.4.4. Coordinate radiation surveys or hazard evaluations with the installation or permit RSO; assist in investigations of suspected overexposure; and perform radiation protection duties at the unit level commensurate with their training and experience. Notify the installation RSO immediately of any unusual radiation exposure incident, and assist in the investigation of the alleged incident.

1.4.5. Ensure unit-operating instructions or regulations/instructions on radiation safety are current. Each RSO should have the following references readily available. AFOSH Standards 48-9, *Radio Frequency Radiation (RFR) Safety Program*, AFOSH Standards 48-139, *Laser Radiation Protection Program*, and CAFBI 48-2, *Radiation Protection Program*.

1.4.6. Ensure compliance with applicable posting and notification requirements of AFI 40-201, AFI 91-204, *Safety Investigations and Reports*, and 10 CFR 19 *Notice, Instructions and Reports to Workers: Inspection and Investigations*, and 20, *Standards For Protection Against Radiation*, or sources of ionizing radiation or x-rays, and AFOSH Standards 48-9 and 48-139 for non-ionizing radiation.

1.4.7. Ensure a replacement RSO is identified and designated in writing by the unit commander, before departing for PCS, extended TDY or separation.

1.4.8. Ensure radiation workers (except contractor personnel) who believe they may be pregnant report as soon as possible to the Women's Health Clinic. If an off base health care provider is used, have the worker report to the Public Health Flight.

1.5. Permit RSO:

1.5.1. With the assistance of the installation RSO, prepares applications for new or renewed permits according to AFI 40-201.

1.5.2. Certifies understanding of, and complies with, reporting requirements for radioactive materials established in AFI's 40-201, 91-204, and 10 CFR 20.

1.5.3. Enforces compliance with permit requirements for storage and use of radioactive materials.

1.5.4. Conducts physical inventories and leak tests upon receipt and at intervals specified in permit.

1.5.5. Notifies the installation RSO of any new sources or configurations, which may affect safety of the CAFB.

2. Radioactive Material Procedures:

2.1. Requisition of Radioisotopes. An AF Radioactive Material (RAM) Permit is required for the possession and use of special purpose, non-stock-listed and/or high intensity radioactive items. Delivery of such items cannot be accepted until a permit is issued by the AF Radioisotope Committee. The proposed using organization will contact the installation RSO who will assist in preparation of the permit application IAW AFI 40-201. The installation RSO will act as the liaison between the proposed user and the RIC.

2.2. Reporting/Certification:

2.2.1. A condition for continuance or issuance of an AF RAM permit is that the permittee comply with all requirements contained in the RAM permit.

2.2.2. Any incident involving radioactive materials other than those in nuclear weapons or nuclear weapons components will immediately be reported to the Wing Command Post, Bioenvironmental Engineer, and the AF Radioisotope Committee. If there is any uncertainty about reporting the incident, it will be reported. Failure or delay in reporting can result in unfavorable publicity and may imperil the continuance of the Air Force Single Broadscope Radioactive Materials License issued by the NRC. The phone number for the Radioisotope Committee is DSN 297-4313. Preferably, the installation RSO should contact the Radioisotope Committee.

2.3. Receiving:

2.3.1. When Supply receives any radioactive material, the Supply Receiving Section will contact Bioenvironmental Engineering to monitor the package for any radiation on the exterior surfaces. The container will also be visually inspected to insure that the seals, when applicable, have not been broken or tampered with and no apparent damage occurred to the container in transit. The Supply Receiving Section will ensure the outside container has the appropriate AFTO Form 9B, **Radioactive Material Warning (Label)**, affixed to indicate radioactive material. Monitoring must be performed as soon as practical after receipt, but not later than one duty day after receipt.

2.3.2. Damaged packages must be surveyed within 3 hours. (49 CFR) *Transportation*

2.3.3. Properly packaged and labeled radioactive material, once surveyed, will be forwarded immediately to the using organization or storage area.

2.3.4. All item records for radioactive materials will be coded with a shipment exception code locally assigned with an exception notice code that will prevent automatic shipments.

2.3.5. Unauthorized shipment of radioactive material, by or to, base organizations is prohibited.

2.4. Storage:

2.4.1. Although the 437 Supply Warehouse is a restricted area, provisions will be made to prevent unauthorized entry into the radioactive materials storage area. Provisions will also be made to prevent unauthorized removal of radioactive material items. The electron tube storage area will be posted with AFTO Form 9C, **Caution, Radioactive Material**, Authorized Entry Only, Contact Radiation Monitor or Supervisor in Charge. Each bin containing radioactive material items will also be labeled with appropriate AFTO Forms.

2.4.2. Supply does not require a permit if permitted RAM in storage at Supply are processed for immediate shipment and are not held for more than 14 days before shipment to the final recipient.

2.5. Contractor Use of Radioactive Materials on CAFB:

2.5.1. Non-Air Force organizations that bring radioactive materials or conduct operations involving radioactive material on CAFB require approval of the installation commander or designee. Here at CAFB the installation RSO is the commander's designee.

2.5.2. The Contracting Squadron and contract monitor will inform contractors of the requirement for local approval for use of radioactive materials on CAFB. The Contracting Officer will also ensure notification requirements are included in local contracts awarded/issued after receipt of notification from the requiring activity. The Contract Specialist will notify the installation RSO (437 ADOS/SGGB) when a contractor wishes to bring radioactive materials on base.

2.5.3. Contractors or other non-Air Force organizations who wish to use radioactive materials at CAFB must submit the following information to the installation RSO for review and approval. The requiring activity will also include these requirements in the statement of work. The required information includes:

2.5.3.1. Evidence of a valid Nuclear Regulatory Commission (NRC) or Agreement State Radioactive Material License.

2.5.3.2. A copy of NRC Form 241, **Report of Proposed Activities in Non-Agreement States**, or a similar document such as a letter listing the specific licensable items the contractor wishes to use on the base. In the case of an Agreement State License, the original must be forwarded by the contractor to the appropriate NRC region.

2.5.3.3. Proof of a valid Air Force contract.

2.5.4. Contractors holding Agreement State Licenses who operate on Air Force bases more than 180 days per year must obtain an NRC license.

2.5.5. Title 10, Part 21 of the Code of Federal Regulations requires contractors using government equipment and materials and/or operating in government facilities to report any defects or non-compliance with NRC guidelines or regulations.

2.5.6. The installation RSO will review contractor plans for use of Radioactive Materials at CAFB and will maintain record documentation of local approvals for inspection.

2.6. Radioactive Material Disposition Procedures.

2.6.1. AFI 40-201 Chapter 3.14, contains basic procedures for disposal of items containing radioactive materials. In general, a request for disposal instructions will be forwarded to Wright Patterson AFB, Ohio for recycling. The unit generating the waste will keep the item until disposal instructions are received. Once the disposal instructions are received, the owning organization, installation RSO, Supply, and Transportation will coordinate to ensure proper packaging, labeling, manifest preparation, distribution of forms and supply turn-in documentation is complete.

2.6.2. Transfer or disposal of radioactive items through the Defense Reutilization and Marketing Office (DRMO) is prohibited.

2.6.3. For disposal of spark gaps and electron tubes, contact Bioenvironmental Engineering or other applicable technical orders for instructions.

3. Radiation Safety Training:

3.1. Training Guidelines: Radiation safety training will be given to workers prior to initial work with radioactive materials or x-rays with refresher training given annually. The extent of training will be commensurate with potential radiological health hazards in the workplace. Radiation safety training is to be conducted by the unit RSO with assistance from installation RSO. A list of attendees will be maintained on AF Form 2767, **Occupational Health Training and Protective Equipment Fit Testing**, (or equivalent form) with copies provided to 437 ADOS/SGGB.

3.2. Ionizing Radiation Safety Training Will Include:

3.2.1. Risk from radiation exposure (**Attachment 3**).

3.2.2. Health risks to children of women (**Attachment 4**) who are occupationally exposed to radiation during pregnancy.

3.2.3. Maximum permissible dose limits.

3.2.4. Required protective measures.

3.2.5. ALARA philosophy and practice.

3.3. RF and Laser Safety Training:

3.3.1. A description of all emitters, potential hazards, and required controls, if any.

3.3.2. Document RF or Laser safety training on both the AF Form 55, **Employee Safety Health Records** and AF Form 2767 or equivalent forms

3.3.3. Signs and symptoms of over exposures.

3.3.4. Who to contact in case of known or suspected exposures.

4. Procedures For Using X-Ray Equipment:

4.1. Sections using x-ray equipment will notify Bioenvironmental Engineering when new equipment is acquired or installed or when facility modification are to be accomplished.

4.2. Bioenvironmental Engineering will conduct annual radiation safety surveys of workplaces where x-ray equipment is used.

4.3. The unit RSO, with the assistance of the installation RSO, will conduct annual radiation safety training for all personnel who routinely work with x-rays.

4.4. Unit RSO's and workers will immediately report to the installation RSO all suspected overexposures. Unit RSO's and radiation workers will assist the installation RSO with investigations of abnormal exposures and incidents.

5. Thermoluminescent Dosimeter (TLD) Program:

5.1. All personnel who are routinely exposed to ionizing radiation (x-rays and certain radioactive sources), and whose exposures are potentially 10 percent or greater of the OEL will be issued a TLD before they can be permitted to work (in accordance with the requirements of 10 CFR 20.1502). TLDs will be issued by the Bioenvironmental Engineering Flight.

5.2. TLDs, when not in use will be stored with a control TLD in a non-radiation area which is cool, dry and out of direct sunlight.

5.3. TLDs will have the name of the individual on the front and will be worn only by that individual. TLDs will be worn only during Air Force operations that involve potential exposure to ionizing radiation. Wear of the TLD outside the Air Force facility where potential exposure to ionizing radiation could occur is prohibited.

5.4. At the end of each monitoring period, Bioenvironmental Engineering Services personnel will exchange each TLD. Supervisors will notify Bioenvironmental Engineering of all new arrivals requiring a TLD and any personnel, who are departing PCS, separating or retiring.

6. Procedures For Sources Of Non-Ionizing Radiation:

6.1. Organizations acquiring new radiofrequency emitters or equipment containing a laser will contact Bioenvironmental Engineering for an initial hazard evaluation. Bioenvironmental Engineering will also be notified when emitter-operating parameters are changed. During baseline and annual industrial hygiene surveys and administrative walk-through, Bioenvironmental Engineering will provide hazard information to workplaces using non-ionizing radiation sources.

6.2. If an overexposure to non-ionizing radiation is suspected, the individual and/or unit RSO will immediately contact the installation RSO (437 ADOS/SGGB) and assist in the accident investigation IAW AFOSH Standards 48-9 and 48-139.

6.3. Sections maintaining, or testing hazardous radiofrequency emitters will be visited at least annually by Bioenvironmental Engineering to assess radiofrequency radiation protection procedures.

6.4. Inventories of all radiofrequency emitters and lasers will be compiled annually by Bioenvironmental Engineering with the inputs from unit RSO's'.

7. Safety : Putting safety first, everyday, everywhere, every mission and balancing risk with operation necessity is one of the 437th Airlift Wing's primary goals. The proper use of radiation protection and understanding and following this CAFB Instruction are critical to attaining this goal. Put safety first!

ROWAYNE A. SCHATZ, JR., Colonel, USAF
Commander

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 40-201, *Managing Radioactive Material In the US Air Force*, 1 September 2000
AFI 48-125, *The US Air Force Personnel Dosimetry Program*, 1 March 1999
AFI 91-204, *Safety Investigations and Reports*, 11 December 2001
AFOSH STD 48-9, *Radio Frequency Radiation (RFR) Safety Program*, 1 August 1997
AFOSH STD 48-139, *Laser Radiation Protection Program*, 10 December 1999
10 CFR 19, *Notice, Instructions and Reports to Workers: Inspection and Investigations*
10 CFR 20, *Standards For Protection Against Radiation*, 1 January 1997
49 CFR, *Transportation*

Abbreviations and Acronyms

AFOSH—Air Force Occupational Safety and Health
ALARA—As Low As Reasonably Achievable
BE—Bioenvironmental Engineering
BEE—Bioenvironmental Engineer
CFR—Code of Federal Regulations
DRMO—Defense Reutilization and Marketing Office
NRC—Nuclear Regulatory Commission
OI—Operating Instruction
OSHA—Occupational Safety and Health Administration
RAM—Radioactive Material
REM—Ranking Equivalent Man
RFR—Radiofrequency Radiation
RIC—Radioisotope Committee
RSO—Radiation Safety Officer
TLD—Thermoluminescent Dosimeter
TO—Technical Order

Terms

As Low As Reasonably Achievable (ALARA)—The ALARA concept is defined as that set of management and administrative actions taken to reduce personnel radiation doses to as low a level as

possible consistent with existing technology, costs, and operational requirements. The ALARA concept was developed in response to scientific evidence that no level of radiation exposure is totally risk free (a risk free threshold cannot be established). While the established maximum permissible doses are conservative and offer a low risk of adverse health effects compared with other hazards of life and occupation. It is prudent that every effort be made to reduce exposures to the lowest level that is reasonably achievable and thereby lower the health risk associated with that exposure.

Employer—A commander, director, or functional manager.

Installation Radiation Safety Officer (RSO)—An individual designated by the Installation Commander to manage the base radiation safety program. This individual will be the most technically qualified person available at the Installation, usually the senior Base Bioenvironmental Engineer. This individual conducts the base wide overall radiation safety program which includes surveillance of all radioactive materials and radiation producing devices. The installation RSO coordinates with and assists the unit and permit RSOs as necessary to ensure a fully comprehensive radiation safety program.

Ionizing Radiation—Energy form, which is powerful enough to cause tissue damage and other reversible or irreversible damage to humans. Tissue damage comes from a breakdown of the atomic structure. The radiation can come from radioactive material or from special radiation producing devices using electronic circuits, including x-ray machines. This form of the energy can be described as particles (alpha, beta, neutrons), or as pure energy (gamma, x-rays).

Must—Indicates a mandatory requirement

Non-Ionizing Radiation—An energy form, which is not powerful enough to affect the atomic structure of materials, it interacts with, including human tissue. Typical examples include radiation from radars, microwave ovens, lasers, and radio transmitters. Non-Ionizing radiation is not specifically addressed in the ALARA concept.

Permit RSO—An individual designated by the unit commander and approved by the USAF Radioisotope Committee to manage the radiation protection aspects of the use of radioactive materials for which a specific USAF Radioactive Material Permit has been issued. Responsibilities for Permit RSOs are described in AFI 40-201, **NOTE:** The unit RSO and permit RSO may be the same person for units that have permitted radioactive material.

Radioactive Material—Material whose nuclei, because of their unstable nature, spontaneously emit alpha or beta particles, gamma rays or neutrons. Radioactive materials at CAFB may include Radioactivity Detection, Identification and Computation (Radiac) check-sources, calibration sources, detector cells in chemical agent detectors, x-ray fluorescence meters, lensatic compasses, watches, ignition exciters, x-ray fluorescence meters, spark gaps and electron tubes.

Shall—Indicates a mandatory requirement

Should—Indicates a preferred method of accomplishment

Supervisor—The supervisor(s), or individual(s) appointed by the supervisor(s), that oversee(s) individuals wearing respiratory protection.

Will—Indicates a mandatory requirement, which expresses a declaration of intent, probability or determination

Unit RSO—An individual designated by the unit commander as the single point of contact for the unit on radiation protection matters. Each operational unit will appoint a unit RSO. Units with both ionizing and

non-ionizing radiation sources may appoint separate RSOs for these areas.

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

US Air Force Radioisotope Committee—A committee established to coordinate the administrative and regulatory aspects of licensing, possession, distribution, use, transfer, and disposal of all radioactive materials in the Air Force except those transferred from the Department of Energy to the Department of Defense in nuclear weapon systems. The committee acts as the single point of Air Force contact with the Nuclear Regulatory Commission or Agreement States on all aspects of Licensing.

Attachment 2

PERSONNEL DOSIMETRY ACTION LEVELS

DESCRIPTION OF ACTION LEVELS AND REQUIRED ACTIONS.

Overexposure Action Level: An exposure above the annual limits set in 10 CFR 20.

Required Action: Investigate according to AFI 48-125. Document all work. Report results to the Occupational Health Working Group in addition to all other reporting requirements.

Abnormal Exposure Action Level: A dosimeter reading which if continued at the same rate for a year would result in an overexposure according to 10 CFR 20 limits.

Action Required: Same as above.

Investigation Action Level: A level above the AF average exposure level which warrants investigation of the circumstances even though no regulatory limit has been exceeded. This often includes doses administratively assigned by the Air Force Institute of Occupational Health (AFIOH) at Brooks AFB for dosimeters misplaced or lost in shipment.

Action Required: Same as above.

Pregnant Worker Action Level: A level set low enough to assure protection of the fetus from radiation hazards.

Action Required: Same as above. In addition, recommend immediate removal of the worker pending medical review of the results of the investigation.

Routine Action Level: An exposure rate below the investigation action level, for which no investigative action is necessary.

ACTION LEVELS FOR RADIATION WORKERS (LEVELS IN MILLIREMS/QTR).

BADGE TYPE	OVEREXPOSURE ACTION LEVEL	ABNORMAL ACTION LEVEL	INVESTIGATION ACTION LEVEL	PREGNANCY ACTION LEVEL
BODY BADGE	5000	1250	125	50/ <u>MONTH</u>
COLLAR BADGE	15000	3750	350	N/A
FINGER RING	50000	12500	1250	N/A

Attachment 3

RISKS FROM RADIATION EXPOSURE

EFFECTS OF IONIZING RADIATION: The amount of radiation an individual receives is called the “dose” and is measured in “REMS”. The average individual in the United States accumulates a dose of 1 REM from natural sources every 10 years. Many people receive additional radiation for medical reasons. The average individual dose to the United States population from medical sources is 0.9 REMs per year. Some of the health effects that exposure to ionizing radiation may cause are cancer (including leukemia), birth defects in future children of exposed parents, and cataracts. The effects (non-genetic) have been observed in studies of medical radiologists and radiotherapy patients who have received large doses of radiation. Cataracts differ from other radiation effects in that a certain minimum dose to the lens of the eye is required before they are observed. Some effects do not have a known lower threshold.

ALARA CONCEPT: The As Low As Reasonably Achievable (ALARA) concept is defined as that set of management and administrative actions taken to reduce the personnel radiation dose to as low a level as possible consistent with existing technology, costs, and operational requirements. The ALARA concept was developed in response to scientific evidence which 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 compared to other hazards of life and occupation, it is prudent that every effort be made to keep exposures ALARA and thereby lower the health risk associated with that exposure. There should be no exposure to ionizing radiation without an expected benefit and the dose should be the lowest possible consistent with the state of technology, costs, and operational requirements.

EXPOSURE MONITORING: To monitor actual doses received, the Air Force uses the radiation Dosimetry program for each person whose duties may result in at least one tenth of the dose described above. These workers are issued thermoluminescent dosimeters (TLDs), and they should wear the TLDs during all duties where they could be potentially exposed to radiation.

RADIATION PROTECTION MEASURES FOR THE WORKPLACE:

1. No radiation exposure duties until entry in TLD Program
2. All technical training needed to qualify the worker to competently operate and control the radiation source.
3. Potential radiation exposure duties permitted only while wearing dosimeter.
4. No interchange of dosimeters or wear of the control badge is allowed.
5. Dosimeters are to be placed in the storage location as soon as potential exposure is over.
6. Report lost/damaged dosimeters at once.
7. Minimize exposures by using recommended techniques and keeping each exposure as low as possible as consistent with existing technology, cost and operational requirements (ALARA).

- 8. Report every unusual exposure incident to the base radiation safety officer.
- 9. Workers who believe they are pregnant report to OB/GYN Clinic. If an off base health care provider is used, report to the Public Health Office.
- 10. No individual under 18 years of age shall be occupationally exposed to ionizing radiation.
- 11. You must notify Bioenvironmental Engineering if you are employed during your off duty time and may be exposed to ionizing radiation during your off-duty employment.

Signature _____ Date _____

(Females also read & sign [Attachment 4](#))

Attachment 4**HEALTH RISKS DURING PREGNANCY**

DISCUSSION OF RADIATION: The amount of radiation an individual receives is called the “dose” and is measured in “REMs”. The average individual in the United States accumulates a dose of 1 REM from natural sources every 10 years. Many people receive additional radiation for medical reasons. The average individual dose to the United States population from medical sources is 0.90 REMs per year. Radiation can also be received from natural sources such as rock or brick structures, from consumer products such as television and from air travel. The average annual dose in the United States from consumer products is 0.00003 REMs. Radiation, like many things, can be harmful.

The occupational exposure limits are set so low; however, that medical evidence gathered over the last 50 years indicates no clinically observable injuries to individuals due to radiation exposures when the established radiation limits are not exceeded. Thus, the risk to individuals at the occupational exposure levels is considered to be very low. It is however, impossible to say the risk is zero. To decrease the risk still further, Air Force policy is to keep actual exposures ALARA. It must be remembered that these limits are for adults. Special consideration is appropriate when the individual is, or may be, an expectant mother, because the exposure of an unborn child may also be involved.

PRENATAL IRRADIATION: The prediction that an unborn child would be more sensitive to radiation than an adult is supported by observations for relatively large doses. Large doses delivered before birth alters both physical development and behavior in experimentally exposed animals. A report of the National Academy of Sciences states that short term doses in the range of 10-20 REMs cause subtle changes in the nerve cells of unborn and infant rats. The report also states however, that no radiation induced changes in development have been demonstrated to result in experimental animals from doses up to about 1 REM per day extended over a large part of the period before birth. The National Academy of Sciences also noted that doses of 25-50 REMs to a pregnant woman can cause growth disturbances in her offspring. Such doses substantially exceed the maximum permissible occupational exposure limits.

A scientific organization called the National Council on Radiation Protection and Measurements recommended that because unborn babies may be more sensitive to radiation than adults, their radiation dose as a result of occupational exposure of the mother should not exceed 0.5 REM. Other scientific groups have also stressed the need to keep radiation doses to unborn children ALARA.

The Air Force has established a policy which is intended to ensure that occupational exposures to pregnant workers are not likely to result in a dose to the unborn child which would exceed the 0.5 REM limit recommended. This policy requires that female workers who may be occupationally exposed to radiation to: 1) be told about the potential hazards to the unborn child if exposed to doses above this recommended limit; 2) be told of the importance of promptly telling her supervisor if she believes she may be pregnant so that appropriate action may be taken to assure the protection of the fetus from excessive radiation exposures; 3) have suspected pregnancies confirmed by a qualified medical practitioner; 4) be given an opportunity to ask and have answered, questions on the risk of exposure to herself and her child presented by her workplace; and 5) be temporarily restricted, without any loss of job security or economic penalty, during pregnancy, from specific tasks involving exposure to radiation which could result in her fetus receiving a total dose of more than 0.5 REM.

Signature: _____ Date _____