

MEDDAC/DENTAC/VS Regulation 40-13

Medical Services

Radiation Protection Program

**Headquarters
U.S. Army Medical Department Activity
Fort George G. Meade
2480 Llewellyn Avenue
Fort George G. Meade, MD 20755-5800
21 February 2003**

Unclassified

SUMMARY of CHANGE

MEDDAC/DENTAC/VS REG 40-13
Radiation Protection Program

Specifically, this revision—

- o Has been published in a new format that includes a cover and this “Summary of Change” page.
- o Reformats the title page. The Contents section now includes the page numbers that the various chapters and paragraphs begin on.

Department of the Army
Headquarters
United States Army Medical Department Activity
2480 Llewellyn Avenue
Fort George G. Meade, Maryland 20755-5800
21 February 2003

* MEDDAC/DENTAC/VS
Regulation 40-13

Medical Services

Radiation Protection Program

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Summary. This regulation provides policies and procedures for the procurement, transfer, storage, modification, use and disposal of ionizing and non-ionizing radiation producing devices; reporting requirements; control and recording of exposures; and radiation protection practices. The above practices will be utilized to assure any potential exposures are “as low as reasonably achievable” (ALARA).

Applicability. This regulation applies to Headquarters, U.S. Army Medical Department Activity, Fort George G. Meade (MEDDAC) (that is, Kimbrough Ambulatory Care Center (KACC)), all MEDDAC outlying clinics, the U.S. Army Dental Activity, Fort George G. Meade (DENTAC), and the Fort Meade Branch Veterinary Services (VS).

Supplementation. Supplementation of this regulation is prohibited.

Proponent. The proponent of this regulation is the Chief, Environmental Health Section (EH), Preventive Medicine Service (PM).

Suggested improvements. Users of this publication are invited to send comments and suggested improvements, by memorandum, directly to the Commander, U.S. Army Medical Department Activity, ATTN: MCXRZA, Fort George G. Meade, MD 20755-5800, or to the MEDDAC’s Command Editor by fax to (301) 677-8088 or e-mail to john.schneider@na.amedd.army.mil.

Distribution. Distribution of this publication is by electronic medium only.

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Glossary

Chapter 1 Introduction

1-1. Purpose

This regulation mandates responsibilities, policies and procedures for the procurement, transfer, storage, modification, use and disposal of ionizing and non-ionizing radiation producing devices; reporting requirements; control and recording of exposures; and radiation protection practices. The above practices will be utilized to assure any potential exposures are ALARA.

1-2. References

Required and related publications are listed in appendix A. Referenced forms are also listed in appendix A.

1-3. Explanation of abbreviations and terms

Abbreviations and special terms used in this regulation are explained in the glossary.

Chapter 2 Responsibilities

2-1. The MEDDAC commander; DENTAC commander; commanders, directors and supervisors of outlying clinics; and Chief, VS

The MEDDAC commander, DENTAC commander, commanders and directors of outlying clinics, and Chief, VS will—

- a. Control all aspects of the Radiation Protection Program within their respective commands.
- b. Ensure that when there are operations involving occupational exposure to radiation sources, an adequately trained and qualified radiation protection officer (RPO), assistant RPO (ARPO), and dosimetry record custodian (DRC) are designated in writing. In lieu of an RPO and ARPO, the DENTAC and VS may appoint radiation protection coordinators (RPCs) and assistant RPCs to act as liaisons to the MEDDAC's RPO.
- c. Ensure the safe use of radiation producing devices under their jurisdiction.
- d. Ensure that adequate resources are available to support the Radiation Protection Program.
- e. Establish adequate measures to control health and safety from ionizing and non-ionizing radiation sources so that the total radiation exposure of each person will be maintained ALARA.
- f. Ensure that occupational exposures and release of radioactive effluent to the environment are within regulatory limits and ALARA.
- g. Ensure that assembly, reassembly, and repair of diagnostic medical, dental, and veterinary systems and components are in accordance with (IAW) manufacturers' instructions.
- h. Ensure that all clinics and sections utilizing ionizing and non-ionizing producing devices publish and enforce standing operating procedures (SOPs) for the use of same.
- i. Ensure that all persons are informed of the hazards when working or frequenting any portion of a controlled area where equipment capable of producing radiation is located.
- j. Ensure that proper warning signs, and where required, proper warning signals and safety switches, are posted and installed, as appropriate.
- k. Ensure a comprehensive inventory of equipment capable of producing radiation is maintained by the RPO.

l. Designate, in writing, a person responsible for preparing and maintaining the Automated Dosimetry Record (ADR) and DD Form 1952 (Dosimeter Application and Record of Occupational Radiation Exposure).

m. Ensure that personnel radiation exposure is monitored and recorded.

2-2. The Chief, Logistics Division (LOG)

The Chief, LOG will—

a. Ensure all diagnostic radiation producing equipment used within the MEDDAC, DENTAC and VS are properly installed, maintained, and calibrated and that validation documentation concerning these requirements is maintained within the guidelines of TB MED 521 and AR 40-61.

b. Forward design plans for the modification of existing radiographic facilities and design and construction specifications for new medical radiographic facilities to the Health Physics Office at Walter Reed Army Medical Center (WRAMC) prior to modification or construction.

c. Provide copies of completed work orders on all diagnostic radiation producing equipment to the RPO.

d. Ensure that the acquisition of ionizing and non-ionizing radiation producing equipment will be in accordance with applicable regulations and is reviewed by the RPO.

e. Ensure the RPO is provided an updated list of radiation producing equipment when requested or upon major changes of equipment.

2-3. Chiefs of clinics and sections that utilize radiology equipment

Chiefs of clinics and sections that utilize radiology equipment will—

a. Ensure personnel receive annual radiation safety training. Training will be documented.

b. Ensure radiation workers complete pre-placement and termination radiation physicals.

c. Ensure all dosimeters used by the clinic or section are stored properly and are changed as instructed by the RPO.

d. Ensure that adequate and timely program documentation concerning accidents and emergencies, personnel changes and training within the clinic or section is maintained and forwarded to the RPO.

e. Ensure that all persons working in or frequenting a controlled (restricted) area are informed of equipment capable of producing ionizing or non-ionizing radiation. These persons will be instructed in the following:

(1) Safety precautions and procedures used to minimize their exposure.

(2) Safety precautions and procedures needed to minimize the exposure of the general public, and purposes and functions of protective clothing and equipment.

f. Ensure all diagnostic radiation producing machines under their jurisdiction are used only by authorized personnel who are trained and qualified to operate radiation producing equipment.

g. Ensure all work orders for repairs to diagnostic radiation producing equipment are submitted to Medical Maintenance within eight hours. Breakdowns that occur on the weekend will be submitted within twenty four hours.

h. Maintain coordination with the RPO to ensure that procedures follow the ALARA concept.

i. Be familiar with all appropriate Federal, Army, and local directives concerning radiation protection.

j. Ensure all employees terminating their employment with the MEDDAC, DENTAC and VS out-process through the RPO.

- k. Correct all observed radiation protection program discrepancies and report to the RPO for resolution or action.
 - l. Report all alleged overexposures to ionizing or non-ionizing radiation or radioactive materials to the RPO.
 - m. Develop clinic or section SOPs to outline the use of ionizing or non-ionizing radiation producing equipment.
 - n. Ensure radiation producing equipment has been set up and operated IAW manufacturers' instruction manuals and clinic or section SOPs.
 - o. Ensure all newly hired employees who will be working with radiation producing devices receive a briefing from the RPO on general radiation safety before they begin working with radiation producing devices.
 - p. Establish a quality improvement program for the operation of radiation producing equipment using TB MED 521 and manufacturers guidelines.
 - q. Calculate and record an administrative dose when a dosimeter is lost or damaged. Report calculated administrative doses to the U.S. Army Ionizing Radiation Dosimetry Center.

2-4. The RPO and ARPO

The RPO and ARPO will—

- a. Exercise staff supervision over the Radiation Protection Program.
- b. Calculate the exposure to ionizing radiation of all persons on whom an ADR is maintained. These calculations will include the most recent three months of reported exposures.
 - (1) Collective exposure. Person-roentgen equivalent man (person-rem) in a quarter. (Person-rem is calculated by adding all exposures during a quarter.)
 - (2) Average exposure. Rem/quarter. (Rem/quarter is calculated by dividing person-rem by the total number of persons monitored.)
 - (3) Highest exposure. Rem.
- c. Evaluate, at least quarterly, the dosimetry records for each person occupationally exposed to ionizing radiation. This review will be documented by signature and date on the ADR.
- d. Advise radiation workers annually, in writing, of their exposure to ionizing radiation.
- e. Advise and assist the commander and radiation workers in all matters pertaining to radiation protection, including instructing and training of workers (users) and others in the safe use of protective equipment and radiation producing devices.
- f. Approve, in writing, the storage locations for thermo-luminescent dosimeters (TLDs).
- g. Establish a pregnancy surveillance and training program.
- h. Provide consultation and advice on the degree of hazards associated with radiation and effectiveness of control measures.
- i. Formulate and supervise an active, documented program designed to keep radiation doses ALARA.
- j. Review the current and proposed uses of radiation sources for compliance with regulations and approved procedures.
- k. Inspect all radiation shields, containers and handling equipment to determine if they are in compliance with regulatory standards.
 - l. Ensure the required radiation warning signs are posted.
 - m. Maintain a current registry of ionizing and non-ionizing radiation producing devices.
 - n. Establish procedures for the centralized issue and control of personnel monitoring devices

(that is, TLDs).

- o. Investigate abnormal or alleged overexposure to ionizing and non-ionizing radiation producing materials.
- p. Report lost or damaged TLD to the RPO.

2-5. The dosimetry record custodian

The ARPO will act as the dosimetry record custodian and will prepare and maintain the records of occupational exposure ionizing radiation.

2-6. Radiographic film processing personnel

Personnel who process radiographic film will follow the quality assurance program guidelines established by the manufacturer, as outlined in TB MED 521 and as designated by the Chief, Department of Radiology.

2-7. Radiation workers

Radiation workers, to include military, Department of the Army (DA) civilian, and contract radiation workers will—

- a. Wear TLD as instructed.
- b. Report lost or damaged TLD immediately to their supervisors.
- c. Place the dosimeters in the proper storage location at the end of each working day and when leaving the work area.
- d. Report for radiation physicals as scheduled.
- e. Review this regulation at least annually. Radiation workers will sign and date a statement noting they have reviewed and understand this regulation. Questions concerning these topics will be relayed to their supervisor, RPO, or Occupational Health Nurse.
- f. Use safety equipment properly.
- g. Immediately report safety violations and procedures inconsistent with the ALARA concept to their supervisor and then to the MEDDAC Safety Manager and RPO. A written statement may be required for serious violations, accidents, and emergencies.
- h. Know and follow procedures, rules, and special instructions in clinic or section SOPs.
- i. Prior to departure from this installation, report to the RPO with their medical records to obtain radiation exposure information.
- j. Declared pregnant radiation workers have lower permissible dose limits to the embryo or fetus during the course of the pregnancy. A female does not fall under the lower limits for pregnant radiation workers until she formally declares her pregnancy in writing to the RPO. A formal declaration of pregnancy is the prerogative of each female radiation worker.
- k. Notify the RPO of any exposure to ionizing and or non-ionizing radiation from additional employment (moonlighting).

Chapter 3

The ALARA Program

3-1. Purpose

To establish procedures to minimize radiation exposure and ensure all exposure is kept ALARA.

3-2. Objectives of the ALARA Program

The objectives of the ALARA program are as follows:

- a. The MEDDAC, DENTAC and VS are committed to the program described in this regulation for keeping individual and collective ionizing radiation exposure ALARA.
- b. A formal review of the Radiation Safety Program will be conducted annually, including ALARA considerations. This will include reviews of operating procedures and past exposure records, inspection, etc., and consultation with the radiation protection staff or outside consultants.
- c. Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposure unless the cost is considered to be unjustified. Improvements that have been sought and modifications that have been considered will be implemented where reasonable, and able to be demonstrated by the management of the MEDDAC, DENTAC and or VS. Where modifications have been recommended but not implemented, the management of the MEDDAC, DENTAC and or VS will be prepared to describe the reason for not implementing them.
- d. In addition to maintaining radiation exposures to individuals ALARA, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest dose to individuals to some fraction of the applicable limit if this involves exposing additional people and significantly increasing the sum of radiation doses received by doses received by all involved individuals.
- e. Radiation exposure standards for radiation workers under the age of 18 will be one-tenth (10%) of the dose of an adult radiation worker.

3-3. Responsibilities

a. *The Safety and Environment of Care Committee.* The Safety and Environment of Care Committee will—

- (1) Ensure that the user justifies his procedures and that exposures will be ALARA (individual and collective).
- (2) Support the RPO for enforcement of the ALARA concept.
- (3) Support the RPO in those instances where it is necessary for the RPO to assert his authority. Where the RPO has been overruled, the committee will record the basis for its action in the minutes of the most immediate meeting.
- (4) Review of the ALARA Program.
- (5) Encourage all radiation workers to review current procedures and develop new procedures as appropriate so as to implement the ALARA concept.
- (6) Utilize the investigational levels in table 3-1 (see page 6) to monitor individual occupational exposure to radiation.
- (7) Review all investigations conducted by the RPO when occupational radiation exposures exceed the investigation levels in table 3-1, below (see page 6).
- (8) Evaluate the MEDDAC's, DENTAC's and VS's overall efforts for maintaining exposures ALARA on an annual basis.

b. *The RPO.* The RPO will—

- (1) Perform an annual review of the Radiation Protection Program for adherence to the ALARA concept. Review of specific procedures may be conducted more frequently.
- (2) Review at least quarterly the external radiation exposures of authorized users and workers to ensure their exposures are ALARA IAW the provision of this program.

Table 3-1 Quarterly review of occupational radiation exposures with an investigational level		
Exposures	Investigational level (mrem per calendar quarter)	
	I	II
Whole body Head and trunk Active blood-forming organs Gonads	125	375
Hands and forearms Feet and ankles Skin of whole body	1250	1125
Eyes and lens	375	1125

Notes:

1. Quarterly exposure is less than Investigational Level I. Except when deemed appropriate by the RPO, no further action will be taken in those instances where an individual's exposure is less than the table values for Investigational Level I in this table.
2. Quarterly exposure equal to or greater than Investigational Level I - but less than Level II. The RPO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I. The RPO will report the results of the reviews at the next Safety and Environment of Care Committee meeting following the receipt or posting of the exposure results. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the exposure is required unless deemed appropriate by the committee. The committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and record the review in the committee minutes.
3. Quarterly exposure equal to or greater than Investigational Level II. The RPO will investigate in a timely manner the cause(s) of all personnel exposures equaling or exceeding Investigational Level II and, if warranted, take action. A report of the investigation, actions taken, if any, and a copy of the individual's ADR will be presented to the Safety and Environment of Care Committee at meeting following the completion of the investigation and will be made available to inspectors (Annual IG Inspection, JCAHO, or Radiation Protection Survey, etc.).
4. Reestablishment of an individual occupational worker's Investigational Level II above that listed in this table. In cases where a worker's exposure is needed to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis that it is consistent with good ALARA practices for that individual or group. Justification for a new Investigational Level II will be documented by the Safety and Environment of Care Committee.

(3) Schedule briefings and educational sessions to inform workers of ALARA program efforts.

(4) Assure that authorized users and workers or ancillary personnel who may be exposed to radiation are instructed in the ALARA philosophy and informed that management, the Safety and Environment of Care Committee, and the RPO are committed to implementing the ALARA concept.

(5) Be in close contact with all users, workers and ancillary personnel in order to develop ALARA procedures for working with radiation producing devices.

(6) Establish procedures for evaluating suggestions of individual workers for improving procedures and encourage the use of those procedures.

(7) Investigate all reported instances of deviation from good ALARA practices and, if possible, determine the causes. When the cause is known, the RPO will require changes in the program to maintain exposures ALARA.

(8) Request an evaluation of x-ray facilities for compliance with design and performance standards. The evaluation of the x-ray systems include an analysis of their location with respect to controlled and non-controlled areas. The survey also includes measurements of radiation levels associated with the operation of the equipment. Radiation protection surveys shall be performed by personnel from the WRAMC Health Physics Office.

(9) Conduct an investigation of any exposure exceeding the investigational level in table 3-1, above, and report the findings, in writing, to the Safety and Environment of Care Committee and the Army Ionizing Radiation Dosimetry Center.

c. Authorized users of radiography equipment. Authorized users and radiography equipment

workers will—

(1) Consult with and receive the approval of the RPO and or the Safety and Environment of Care Committee during the planning stage before using new radiation producing devices and procedures.

(2) Evaluate all procedures before using radiation producing devices to ensure exposures will be kept ALARA.

Chapter 4

The Pregnancy Surveillance Program

4-1. Purpose

The purpose of the Pregnancy Surveillance Program is to establish procedures to monitor pregnant female workers who are occupationally exposed to radiation.

4-2. General

a. This program will be managed by the RPO with the direct assistance of all supervisors of radiation workers.

b. IAW with U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 8.29, an occupationally exposed woman who declares her pregnancy in writing is subject to the more restrictive dose limits for the embryo or fetus during the remainder of her pregnancy. The dose limit of 500 millirems (mrems) for the total gestation period applies to the embryo or fetus and is controlled by restricting the exposure to the declared pregnant woman.

4-3. Responsibilities

a. *The RPO.* The RRO will—

(1) Review the worker's radiation exposure history to verify compliance with 0.5 rem maximum permissible exposure for the entire gestation period.

(2) Counsel workers and supervisors about risks and issues addressed in NRC Regulatory Guide 8.13 and complete a pregnancy counseling memorandum IAW the sample in figure 4-1, below.

(3) Provide a copy of NRC Regulatory Guide 8.13 to the declared pregnant worker.

(4) Provide the Occupational Health Clinic a record of the declared pregnant worker's past exposure history. Additionally, advice or a recommendation from the WRAMC Health Physics Office and the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) concerning continuation of duties will be obtained, if needed.

b. *Supervisors of radiation workers.* Supervisors of radiation workers will—

(1) Schedule counseling sessions with Occupational Health Clinic (OH) for workers with confirmed pregnancies, if so desired by the pregnant workers.

(2) Be prepared to rotate pregnant workers from duties involving exposure to ionizing radiation if the monthly dose during declared pregnancy will exceed 50 millirem per month.

c. *Female radiation workers.* Each female radiation worker will—

(1) If she chooses to do so, immediately notify her supervisor, the Occupational Health Clinic and the RPO when pregnancy is expected or confirmed.

(2) Attend a counseling session with the RPO and or Occupational Health personnel

regarding continuation of duties and acknowledge receipt of the pregnancy counseling memorandum from the RPO (see figure 4-1) with a response formatted IAW figure 4-2 (see page 9).

MCXR-PM-EH

Date

MEMORANDUM FOR CHIEF, *CLINIC OR SECTION IN WHICH THE EMPLOYEE WORKS*

SUBJECT: Pregnancy Counseling

1. On *date*, *name of employee*, was given instructions concerning prenatal radiation exposure in accordance with the guidelines in U.S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 8.13, Revision 3, dated June 1999.
2. The instructions include the information in USNRC Regulatory Guide 8.13. These instructions were followed up by oral questioning to ensure understanding of the relative risks involved with prenatal radiation exposures, discussion of her exposure history, and policies of the U.S. Army Medical Department Activity, Fort George G. Meade. It concluded with an opportunity for her to ask questions.
3. The instructions were presented by a member of this office in the presence of her supervisor.

RPO'S SIGNATURE BLOCK
Radiation Protection Officer,
Preventive Medicine Service

Notes:

1. This memorandum will be completed in accordance with AR 25-50. The font used will be 12 point Times New Roman.
2. Text in *italics* indicates where information specific to the memorandum being completed is to be inserted.

Figure 4-1. Example format for a pregnancy counseling memorandum

OFFICE SYMBOL

Date

MEMORANDUM FOR COMMANDER, USAMEDDAC, ATTN: MCXR-PM-EH (RPO),
FORT GEORGE G. MEADE, MD 20755-5800

SUBJECT: Acknowledgment of Receipt of Prenatal Radiation Exposure Instructions

1. I hereby acknowledge that I have received instructions on the effects of prenatal radiation exposure, received and read a copy of USNRC Regulatory Guide 8.13, was orally questioned regarding the information presented, and that I was provided the opportunity to have all questions satisfactorily answered.

2. My expected delivery date is *month and year*.

EMPLOYEE'S
SIGNATURE BLOCK

Notes:

1. This memorandum will be completed in accordance with AR 25-50. The font used will be 12 point Times New Roman.
2. Text in *italics* indicates where information specific to the memorandum being completed is to be inserted.

Figure 4-2. Example format for an acknowledgment to a pregnancy counseling memorandum

Chapter 5 The Medical Surveillance Screening Programs

5-1. Purpose

The purpose of this chapter is to define OH guidelines on medical surveillance screening.

5-2. Responsibilities

- a. *Clinic and section chiefs*. Clinic and section chiefs will—
 - (1) Ensure all employees comply with the requirement for annual medical surveillance.
 - (2) Ensure that personnel who incur radiation injuries or illness process through OH for proper record keeping and treatment in the proper clinic within the medical treatment facility (MTF), unless the injury requires immediate care, in which case the person will proceed directly to an emergency room at another MTF.
- b. *The RPO*. The RPO will—
 - (1) Maintain ADR and DD Forms 1952.

(2) Provide a copy of NCR Form 5 (Occupational Exposure Record for a Monitoring Period) annually for insertion into the medical records.

c. *The Chief, OH.* The Chief, OH will—

(1) Perform pre-placement examinations and annual medical surveillance on all authorized personnel (active duty and civilian) who have the potential for exposure to ionizing or non-ionizing radiation in the performance of their jobs.

(2) Conduct examinations on job related medical surveillance and administrative medical examinations.

(3) Document the description of any unusual radiation exposure, accidents, incidents or therapeutic exposure, and complete a report of a complete blood count with differential as a baseline.

(4) Provide follow up care for medical personnel within the Department of Radiology.

(5) Maintain civilian employee medical records on file, and file NCR Form 5 when presented by the RPO.

(6) Provide employee education at the time of the employee visit, at the work site during visits, and in conjunction with the RPO when requested.

e. *Employees.* Employees will—

(1) Schedule annual medical surveillance appointments with OH.

(2) Process through OH if and when radiation injuries or illnesses are incurred.

5-3. Procedure

a. When deemed necessary by the supporting medical authority, medical examination of individuals occupationally exposed to ionizing radiation will be conducted IAW AR 40-5, chapter 5. Preventive Medicine personnel will ensure that occupational exposure to ionizing radiation is included in health hazard information modules and medical information module systems.

b. Incident or accident surveillance. Refer any individual to OH who is suspected of having received a radiation dose or exposure in excess of the limits. The referred individual will receive examination and treatment determined appropriate by an occupational health physician in consultation with the RPO.

Chapter 6

Safety Procedures

6-1. Purpose

To establish procedures for the safe use of ionizing radiation.

6-2. Procedures

a. Safety procedures for occupationally exposed x-ray workers are as follows:

(1) Only personnel whose presence is necessary may remain in the room and all other personnel must leave the room during x-ray procedures. These persons must wear aprons of at least 0.25mm lead equivalence.

(2) Patients who need to be assisted or held during an x-ray procedure should be held by an individual who is not occupationally exposed to x-rays.

(3) Bucky slot covers, leaded tower curtains, and other shielding devices provided on the x-ray system must be used during fluoroscopy.

- (4) Doors to the x-ray room must be closed during an x-ray procedure.
 - (5) Lead aprons and gonad shields must be available on all mobile x-ray systems. The operator must wear a lead apron during the procedure.
 - (6) Personnel TLD must be worn by all individuals as designated by the RPO. The whole-body TLD must be worn between the shoulders and the hips.
- b. Safety procedures for patients are as follows:
- (1) All female patients of child bearing age are to be questioned about possibility of pregnancy by the referring physician, receptionist and technologist. Any patient who is determined to be possibly pregnant is not to have any radiographic examination performed without the knowledge and consent of the referring physician or radiologist.
 - (2) All women with known pregnancies are to have abdominal shielding during all radiographic examination except those that are of the abdominal area (for example, fetograms, kidneys, ureter and bladder (KUB) and pelvis). The decision to order radiographic examination on pregnant patients is to be made only by the referring physician and in consultation with the radiologist.
 - (3) The reproductive organs of patients who are of reproductive age or younger must be shielded from the useful x-ray beam. Shielding will not be utilized when the shield covers the area of interest.
 - (4) The useful x-ray beam size must be collimated to the smallest area practical and consent with the radiological examination being performed. It must in no instance exceed the maximum dimension of the film size. Evidence of proper collimation and or shielding should appear on all radiographs.
 - (5) The cumulative radiation timer (0 to 5 minutes) should be set for maximum exposure time at the beginning of each fluoroscopic procedure. Thereafter, it should only be reset after it has completely run out of time or the audible signal is sounded.
 - (6) During dental x-ray examinations, a lead apron should be used when appropriate. A lead apron is not required for panoramic x-ray examinations. Thyroid shielding should be used for patients when appropriate. The shielding must not be a substitute for adequate beam collimation and alignment.
 - (7) General guidance on patient protection during medical and dental x-ray examinations is provided in TB MED 521, chapter 2.
- c. Inspection of protective gloves and aprons.
- (1) All lead aprons, gloves, drapes, gonad shields, and other lead vinyl flexible shields will be inspected semiannually and must be inspected at least annually for safety defects. Appropriate written records of these inspections will be maintained by the Performance Improvement/Risk Manager.
 - (2) Lead lined gloves, aprons and other shielding devices showing significant wear or leakage defects will be removed from use and replaced as required.
 - (3) Appropriate devices must be provided for the proper storage of lead aprons and gloves to minimize impairment by improper handling and storage. For information on storage and handling, see TB MED 521.

Chapter 7

Training and Records

7-1. Purpose

To define record keeping and training requirements for radiation workers.

7-2. Training

- a. Pre-placement training will be accomplished prior to placing an individual as a radiation worker.
- b. As a minimum, radiation workers will receive at least one class per year on the biological risks of exposure to ionizing radiation.

7-3. Records

- a. The MEDDAC, DENTAC and VS dosimetry records custodians will maintain the ADR.
- b. Occupationally exposed individuals, visitors and transient personnel who work in or frequent a restricted area, regardless of whether or not they are issued a dosimeter, shall complete DD Form 1952.
- c. An ADR will be initiated for each person when he or she is enrolled in the dosimetry program. A chargeout card will show that the dosimetry records are maintained by the designated custodian or RPO.
- d. The dosimetry records are a permanent condition of the individuals' medical records and will accompany transferring personnel in their medical records jacket.
- e. Transferring personnel will outprocess through the RPO and sign release forms to obtain their dosimetry records. They must provide a copy of their orders to the RPO to expedite notification to the gaining organization of any exposures not entered on the dosimetry records.
- f. Upon receipt of an individual's exposure records, the RPO must provide written notification to the gaining organization of the individual's ionizing radiation exposure.

Chapter 8

Installation, Maintenance, and Calibration of X-ray Producing Systems

8-1. Purpose

To define the requirements, policies, and procedures for the installation, maintenance and calibration of x-ray producing systems.

8-2. Procedures

- a. All diagnostic x-ray devices shall be maintained to meet the minimum performance standards required by TB MED 521.
- b. Maintenance will be accomplished at least annually and within the manufacturer's schedule of maintenance. X-ray systems that fail to meet these standards will be repaired or withdrawn from service.
- c. The RPO will be notified if an x-ray system is withdrawn from service, as well as of any corrective actions that affect the output of the x-ray system prior to returning the system to use.
- d. Prior to the installation of a new x-ray system, the required health physics survey will be completed. Requests for health physics surveys will be submitted in a timely manner through the

RPO to the Health Physics Office at WRAMC.

e. Installation. Acceptance inspection will be done through the Medical Care Support Equipment (MEDCASE) Program performed by the U.S. Army Medical Material Agency, except for MEDCASE performed by the Defense Personnel Support Center.

f. FDA Form 2579 (Report of Assembly of a Diagnostic System) is required by federal law and must be maintained on file until the pertinent system has been turned in or transferred to another medical, dental or veterinary treatment facility.

g. Calibration. DD Form 2164 (X-Ray Verification/Certification Worksheet) must be maintained on file for one year for all x-ray equipment for one year or until completion of the next x-ray calibration, whichever occurs first.

h. Radiation protection surveys. Maintain a record of the first and the latest radiation survey for each system.

Chapter 9

Performance Improvement (PI)

9-1. Purpose

To incorporate a PI program into the Radiation Protection Program.

9-2. Procedures

The PI Program will—

a. Be conducted to ensure that diagnostic quality radiographs produced are consistent with the facility's mission and capabilities. The PI Program shall be properly documented, monitored, and reviewed regularly. The PI Program may be modified by individual activities or clinics with approval of the RPO to accommodate special equipment and situational requirements.

b. Ensure that radiographic films shall be processed in properly designed and equipped rooms; both manual and automatic processing systems shall use developers, fixers, temperatures, and processing times that produce optimal diagnostic quality radiographs with minimum exposure to the patient. Film processing materials and techniques shall be those recommended by the x-ray film manufacturer or those otherwise tested.

c. Ensure that radiographic films shall be properly handled and stored to reduce fogging and other damage.

d. Ensure the performance of diagnostic x-ray examinations shall be according to procedures for patient preparation, instruction, positioning, and shielding; use of technique charts; and the monitoring of finished radiographs to reduce retakes due to operational deficiencies.

e. Ensure the current technique charts, and cooling curves or anode heat calculators are posted near or on the x-ray control panel of each radiographic x-ray system.

Appendix A References

Section I Required References

AR 40-5

Preventive Medicine. (Cited in para 5-3.)

AR 40-61

Medical Logistics Policies and Procedures. (Cited in para 2-2.)

TB MED 521

Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma Beam Equipment. (Cited in paras 2-2, 2-3, 2-6, 6-2 and 8-2.)

NCR Regulatory Guide 8.13, Revision 3

Instruction Concerning Prenatal Radiation Exposure

Section II Related Publications

A related publication is merely a source of additional information. The user does not have to read it to understand this regulation.

AR 25-50

Preparing and Managing Correspondence

AR 40-14

Occupational Ionizing Radiation Personnel Dosimetry

AR 40-46

Control of Health Hazards from Laser and Other High Intensity Optical Sources

AR 40-66

Medical Record Administration

AR 40-400

Patient Administration

AR 385-40

Accident Reporting and Records

DA Pam 40-18

Personnel Dosimetry Guidance and Dose Recording procedures for Personnel Occupationally Exposed to Ionizing Radiation

MEDCOM Reg 40-42

U.S. Army Medical Command Radiation Safety Program

NRC Regulatory Guide 8.29

Instruction Concerning Risks from Occupational Radiation Exposure

NRCP Report No. 35 (National Council on Radiation Protection and Measurements)

Dental X-Ray Protection

NRCP Report No. 54

Medical Radiation Exposure of Prregnant and Potentially Pregnant Women

NRCP Report No. 91

Recommendations on Limits for Exposure to Ionizing Radiation

NRCP Report No. 99

Quality Improvement for Diagnostic Imaging

NRCP Report No. 100

Exposure of the U.S. Population from Diagnostic Medical Radiation

NRCP Report No. 101

Exposure of the U.S. Population from Occupational Radiation

NRCP Report No. 102

Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies Up to 50 MeV; Equipment Design, Performance, and Use

NRCP Report No. 105

Radiation Protection for Medical and Allied Health Personnel

TB MED 523

Control of Hazards to Health from Microwave and Radio Frequency and Ultrasound

TB MED 524

Control of Hazards to Health from Laser Radiation

TB MED 525

Control of Hazards to Health from Ionizing Radiation Used by the Army Medical Department

**Section III
Prescribed Forms**

This section contains no entries.

**Section IV
Referenced Forms**

DD Form 1952

Dosimeter Application and Record of Occupational Radiation Exposure

DD Form 2164

X-Ray Verification/Certification Worksheet

FDA Form 2579

Report of Assembly of a Diagnostic X-Ray System

NRC Form 5

Occupational Exposure Record for a Monitoring Period

Appendix B

The Non-ionizing Radiation Protection Program (NRPP) for Laser and High Intensity Light Sources

B-1. The Army Radiation Protection Program (RPP)

The RPP directed towards protection of personnel from unnecessary exposure to ionizing and non-ionizing radiation. The NRPP governs, among other things, the radiation protection control of laser and high intensity light sources. AR 40-5 specifies the following with regard to implementing and managing such a program:

- a. The commander will designate, in writing, an RPO and an ARPO whose primary duty is to manage the RPP.
- b. The commander will provide training, equipment, and an appropriate support staff to the RPO.
- c. The RPO will be responsible for managing the ionizing RPP and the NRPP.
- d. The RPO should maintain complete program files to include current records of inventory, SOPs, and related safety instruction.
- e. Personnel potentially exposed to levels in excess of personnel exposure limits will receive medical examinations in accordance with appropriate Army regulations, TB MEDs, etc.

B-2. Elements of radiation control

Radiation protection control is required for potentially hazardous sources of optical radiation. Commanders, directors and supervisors of activities that have such sources in their inventory are required to ensure that applicable NRPP elements are in place and functional. The following general list of radiation control elements applies in most cases:

- a. The supervisor shall determine personnel categories for each employee and provide a list of laser workers to the RPO. Laser workers are those individuals who routinely work with Class 3b and Class 4 lasers including personnel operating lasers for medical treatment. Laser workers will have an ocular history, visual acuity measured at distance for each eye and a test for central visual fields and macular function (Amsler Grid or similar test) performed by an optometrist or ophthalmologist to determine the baseline visual acuity and ocular health status of the laser workers. Laser workers having previously undocumented abnormal findings or significant changes will be referred for Diagnostic Examination.
- b. The SOPs will be published and enforced, with copies staffed and approved by the RPO and MEDDAC Safety Officer. These SOPs will specify all radiation safety policies relative to equipment and personnel control to ensure that exposure of personnel is minimized. Under no circumstances should exposure exceed established limits.
- c. All persons who could be accidentally exposed to potentially hazardous sources of optical radiation will be informed of the radiation hazards and instructed regarding the rules and procedures to be complied with. Instructions will include SOP familiarization or review, proper use of protective equipment and devices, accident reporting procedures, routine checks or surveys prescribed to ensure radiation safety, and procedures for maintaining an operational log for recording radiation safety-related events (safety interlock and warning signs or light overrides, prohibited radiation zone, violations, etc.). Radiation safety briefings should be given annually and before a new piece of laser equipment is used in the clinic or section, and records of this training will be forwarded to the RPO. These records will include a brief outline and a list of persons who

received the training.

d. All controlled areas will be properly marked, and will have proper warning signs, barricades, lights, alarms, safety switches, etc.

e. Individuals will be designated, in writing, to be notified in the event of an optical radiation source or related safety feature malfunction that could produce radiation levels in excess of the personnel exposure limits. A list of such persons, with phone numbers, will be posted in the controlled area.

f. For any known or suspected overexposure to laser radiation, contact the RPO and MEDDAC Safety Manager. Laser accident reporting procedures are in AR 40-400, chapter 6, and AR 385-40, paragraph 9-2. In addition, the RPO or MEDDAC Safety Manager will contact the following organizations as soon as possible after an overexposure occurs:

(1) Vision Conservation Office, CHPPM, (410) 436-3534.

(2) Laser/Microwave Division, CHPPM, (410) 436-3000.

(3) Ocular Hazards Research, U.S. Army Medical Research Detachment, (210) 536-4620.

g. A comprehensive inventory of all sources will be maintained, and a copy of this inventory will be forwarded to the RPO and MEDDAC Safety Manager.

B-3. Evaluation of optical radiation devices by CHPPM

Commanders of activities that design or develop optical radiation devices or incorporate them into Army systems are required to have such devices or systems evaluated by CHPPM for potential health hazards before they are accepted or adopted. The evaluation will take place during the research, development, test and evaluation phase of the equipment. A reevaluation by CHPPM is required if substantial modifications are made to the equipment between the initial evaluation and final acceptance or adoption (AR 40-5).

Glossary

Section I

Abbreviations

ADR

Automated Dosimetry Record

ALARA

as low as reasonably achievable

ARPO

assistant radiation protection officer

CHPPM

U.S. Army Center for Health Promotion and Preventive Medicine

DA

Department of the Army

DENCL

Former acronym for Fort Meade Dental Clinic Command. (See DENTAC.)

DENTAC

U.S. Army Dental Activity, Fort George G. Meade

DRC

dose record custodian

EH

Environmental Health Section, PM, KACC

FMVSB

Former acronym for Fort Meade Veterinary Services Branch. (See VS.)

IAW

in accordance with

KACC

Kimbrough Ambulatory Care Center

LOG

Logistics Division, KACC

MEDDAC

U.S. Army Medical Department Activity, Fort George G. Meade

MREM

millirem (one thousandth of a rem)

NRC

Nuclear Regulatory Commission

OH

occupational health clinic

PM

Preventive Medicine Service, Kimbrough Ambulatory Care Center

REM

roentgen equivalent man

RPC

radiation protection coordinator

RPO

radiation protection officer

SOP

standing operating procedure

TLD

thermo-luminescent dosimeter

VS

Fort Meade Branch Veterinary Services

WRAMC

Walter Reed Army Medical Center

Section II

Terms

As low as reasonably achievable (ALARA)

An operating philosophy in which occupational exposures are reduced as far below specified limits as is reasonably achievable.

Calendar quarter

A period of not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter will begin in January or begin with the dosimetry issue cycle closest to January. Subsequent calendar quarters will begin within 12 or 14 weeks of that date so that no day is included in both quarters or omitted from both quarters.

Controlled area

Any area to which access is controlled to protect personnel

from exposure to ionizing radiation or radioactive materials. This means that a controlled area requires control of access, occupancy, working conditions, and egress. Areas not included are those used as residential quarters or areas where food is stored, prepared, or served. However, a separate room or rooms in a residential building or a building in which food is stored, prepared, or served may be set apart as a controlled area. This does not apply to facilities that use ionizing radiation sources for food preservation.

Declared pregnant woman

A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

Dose

A general term denoting the quantity of radiation absorbed or energy absorbed per unit of mass, by the body or any portion of the body. For special purposes, it must be appropriately qualified and can variously mean absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, or total effective dose equivalent.

Dosimeter

A device intended to measure radiation or evaluate any quantity of irradiation for the purpose of determining an occupa-

tionally exposed individual's ionizing radiation dose. Examples include film badges, thermo-luminescent dosimeters, self-reading pocket dosimeters, pocket chambers, and finger dosimeters.

Exposure

A measure of the ionization produced in air by X or gamma radiation; it is the sum of the electrical charges on all of the ions of one sign produced in air when all electrons liberated by photons (X or gamma radiation) in a suitable small element of volume of air are completely stopped in air, divided by the mass of the air in the volume. The special unit of exposure is the roentgen (R); the condition of being irradiated by ionizing radiation.

Ionizing radiation

Electromagnetic or particulate radiation capable of producing ions as it passes through matter. Alpha and beta particles, gamma rays, and neutrons are examples of ionizing radiation.

Ionizing radiation protection program

The management effort by command that includes monitoring the use of ionizing radiation producing devices and radioactive materials. The purpose is to ensure that the exposure to persons from ionizing radiation and the release of radioactive effluent to the environment is as low as is

reasonably achievable (as far below specified radiation exposure standards as is practicable).

Non-ionizing radiation

Non-ionizing radiation does not have enough energy to ionize atoms; it vibrates and rotates molecules, causing heating. Non-ionizing radiation is classified by frequency, which is stated in units of hertz. Non-ionizing radiation includes microwave generation (microwave ovens and diathermy units), high intensity optical sources (lasers and ultraviolet light), and ultrasonic units.

Occupational exposure to ionizing radiation

Exposure to ionizing radiation that is incurred because of an individual's (military or civilian) employment or duties that are in direct support of the use of radioactive materials or equipment capable of producing ionizing radiation. Occupational exposure does not include the exposure of an individual, as a patient, to sources of ionizing radiation or radioactive material for medical or dental diagnosis or therapy of that person. Occupational exposure does not include exposure to naturally occurring ionizing radiation.

Occupationally exposed individual

An individual whose work is performed in a controlled (restricted area) and who might

be exposed to more than 5 percent of the radiation exposure standards in appendix B because of employment or duties in a controlled (restricted area). The term “occupationally exposed individual” is synonymous with the term “radiation worker.”

Performance improvement

A comprehensive concept that comprises all of the management practices used by the radiology department to ensure every imaging procedure is necessary and appropriate to the clinical problem; that images generated contain information critical to the solution of that problem; that recorded information is correctly interpreted and made available in a timely fashion to the patient’s physician; and that examination results in the lowest possible radiation exposure, cost and inconvenience to the patient consistent with the objective.

Personnel dosimeter custodian

The person, usually the clinic noncommissioned officer in charge, responsible for ensuring that newly assigned and

terminating personnel in and out process through the Radiation Protection Officer.

Personnel monitoring device

Same as dosimeter. (See above).

Radiation absorbed dose

A unit used to measure the amount of radiation energy transferred to an irradiated object by any type of ionizing radiation. One RAD is equivalent to an energy transferred 100 ERG per gram.

Radiation sources

Material, equipment, or devices that generate or are capable of generating ionizing or non-ionizing radiation.

Radiation worker

Same as occupationally exposed individual. (See above.)

Radiation survey

Diagnostic evaluation of the ionizing and non-ionizing radiation producing devices.

Restricted area

Same as controlled area. (See above.)

Roentgen equivalent man

The traditional unit of dose equivalent; one REM is the absorbed dose of any type of ionizing radiation that produces the same biological effect as one RAD of x-radiation.

Roentgen

Internationally accepted unit for measurement of exposure to X and gamma radiation. One roentgen is the photon exposure which produces a total positive or negative ion charge of 2.58×10^4 coulombs per kilogram of dry air.

Termination

The end of employment with the Department of the Army, US Army Reserve, Army National Guard or Defense Logistics Agency. Also the end of work assignment in a controlled (restricted) area. The expectation or specific scheduling of reentry into a controlled (restricted) area would not be permitted during the remainder of the terminating calendar quarter.