TG 090

UNITED STATES ARMY ENVIRONMENTAL HYGIENE AGENCY

ABERDEEN PROVING GROUND, MD 21010

A E H A

RADIATION PROTECTION PROGRAM
DEPARTMENT OF THE ARMY

(Summary of the Department of the Army radiation protection program for sources of radiation)

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Technical Guide No. 090

RADIATION PROTECTION PROGRAM

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ABERDEEN PROVING GROUND, MARYLAND 21010

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RADIATION PROTECTION PROGRAM DEPARTMENT OF THE ARMY*

(Summary of the Department of the Army radiation protection program for sources of radiation)

I. GENERAL.

A. Many regulations, guides, and standards applicable to sources of radiation have been developed or adopted by Department of the Army (DA) to assist an installation/activity commander in establishing and maintaining an adequate radiation protection program when such sources are used within his command. The main objective of a radiation protection program is to maintain the exposure of individuals to radiation and the release of radioactive effluents to the environment as low as is reasonably achievable, which is well within specified limits. Appropriate control measures are to be established so that the radiation exposure of individuals is no greater than the limits prescribed in current Army directives which are based in part on the radiation protection standards recommended by the US Environmental Protection Agency (EPA), the National Council on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), the American National Standards Institute (ANSI), and the International Atomic Energy Agency (IAEA).

B. The US Nuclear Regulatory Commission (NRC) in Title 10, Code of Federal Regulations (CFR), Part 20, and the Department of Labor in Title 29, CFR, Section 1910.96, have promulgated standards for protection against ionizing radiation. The use of radioactive materials or other sources of ionizing radiation not subject to licensing control by the NRC are not subject to the requirements of the NRC. However, the standards promulgated in 29 CFR 1910.96 and 1910.97 are applicable to all Army installations/ activities possessing and using sources of ionizing and microwave radiation, respectively, and implemented by AR 40-583 and AR 385-10.

C. The Food and Drug Administration (FDA), Department of Health and Human Services (formerly Department of Health, Education, and Welfare) in Title 21, CFR, Chapter 1, Subchapter J, Radiological Health, has promulgated performance standards for electronic products such as television receivers, cold-cathode gas discharge tubes, diagnostic medical and dental x-ray systems, microwave ovens, cabinet x-ray systems, laser products, and ultrasonic therapy products.

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* This Technical Guide supersedes Technical Guide, Radiological Protection Program - Department of the Army, January 1979.

D. The FDA in Title 21, CFR, Parts 54, 310, 312, 314, 361 and 601, has promulgated standards for the control and registration of radiopharmaceuticals. The transfer of regulatory authority from NRC to FDA voided the exceptions from the investigational drug regulations of materials which appeared on the NRC's "well established" radiopharmaceutical list. No exemption has ever been in effect for accelerator-produced or naturally occurring radioactive materials. The Army has implemented these requirements for the use of radiopharmaceuticals, in humans, by publishing AR 40-7, AR 40-37, AR 40-38, and AR 70-25.

E. Refer to Appendix A, References, for titles and dates of all publications.

II. POLICY AND GUIDANCE. The Surgeon General, DA, is the principal advisor to the DA staff for all health and medical matters pertaining to the Army and has primary staff responsibility for establishing policy and guidance for the control of radiological health hazards in accordance with AR 10-5.

III. RESPONSIBILITIES OF USA HEALTH SERVICES COMMAND (HSC). The Commander, HSC, as a major Army commander, in accordance with AR 10-43, is responsible for:

A. Planning, directing, coordinating, and supervising the radiological hygiene functions of assigned installations/activities in accordance with DA policy.

B. Providing radiological hygiene support services for all DA activities in CONUS and for other departments, agencies, activities, and organizations as directed.

IV. RESPONSIBILITIES OF USA ENVIRONMENTAL HYGIENE AGENCY (USAEHA). The USAEHA assists The Surgeon General and the Commander, HSC, in discharging their responsibilities as specified in AR 40-5, HSC Regulation 10-1, and HSC Supplement to AR 40-5 by:

A. Conducting radiation protection surveys on a regularly scheduled basis or when specifically requested by the commander of any Army installation/activity which uses sources of radiation.

B. Reviewing the radiological hygiene aspects of:

1. DA publications pertaining to control measures established for the use of radiation sources.

2. Applications to use radioactive materials which are controlled by the NRC and those which are not licensed by the NRC.

3. Blueprints, drawings and other documents relating to the design of facilities and devices to be used for generating radiation.

C. Performing technical review and evaluation of medical and nonmedical materiel to determine the existence of possible radiological health hazards and compliance with certain performance standards (AR 10-43 and AR 70-1).

D. Providing consultation, laboratory services, and training programs to personnel responsible for the control of radiation sources and safeguards pertaining thereto.

E. Providing technical support to both US Army Health Services Command Inspector General (HSC-IG) and Department of the Army Inspector General (DAIG) for the evaluation of radiation protection programs at medical facilities and reactor facilities, respectively.

V. RESPONSIBILITIES OF MAJOR ARMY COMMANDS (MACOM). Each MACOM headquarters and subordinate command has staff elements responsible for matters pertaining to radiation safety. In general, these personnel have had training in radiation safety; they make periodic staff visits to installations/activities within the command and, if qualified, perform followup surveys of radiation protection surveys performed by USAEHA.

VI. USAEHA MISSION SERVICES.

A. Health Physics Division.

1. Field Services. Provides routinely scheduled field surveys and, upon request, training, special studies and evaluations of sources of ionizing radiation. Field services are provided world-wide with prior approval of The Surgeon General for OCONUS and the Commander, HSC for CONUS surveys (AR 40-5).

2. Types and Frequency of Routine Surveys:

Type of Survey	Frequency
Army Nuclear Reactors (Part of DAIG Team).	Annual
Army Hospitals for Human Use (Part of HSC-IG Team).	Annual
MEDDAC to be Accredited by Joint Commission on Accreditation of Hospitals (JCAH).	2 years
Corps of Engineers Civil Works Programs.	3 years
Defense Logistics Agency (DLA) Depots.	3 years
DARCOM Facilities Including Depots, Arsenals, Major Subordinate Commands and Research Facilities.	3 years

Type of Survey (Continued)	Frequency
All Installations/Activities Possessing an NRC License or DA Radioactive Material Authorization; or other sources of ionizing radiation.	3 years
US Army National Guard and US Army Reserve Facilities using Diagnostic X-Ray Systems for Routine Medical Purposes.	3 years

3. Reports. Findings and recommendations for eliminating or controlling potential health hazards and recommended administrative procedures are provided in the IG or radiation protection survey report of each installation/activity surveyed. These reports are forwarded through command channels to the installation/activity commander.

4. Training. In addition to continuous on-the-job training for USAEHA personnel, short formal courses and workshops are presented by USAEHA. Personnel from USAEHA may assist in radiological hygiene training programs, as they pertain to ionizing radiation sources and radioactive materials, for safety and supply personnel at DLA activities, and other personnel responsible for radiological hygiene in the Army.

5. Ionizing Radiation Protection Standards and Criteria.

a. RPO and Radiation Control Committee.

(1) Where there are operations involving the use of multiple ionizing radiation sources, the commander must designate, in writing, a Radiation Protection Officer (RPO) and an alternate RPO to provide consultation and advice on the degree of hazards associated with radiation sources and the effectiveness of the measures to control these hazards, and to supervise the ionizing radiation protection program (AR 40-14). The RPO is normally required to perform monthly radiation protection surveys and other health physics functions throughout the installation/activity (see AR 40-37 and Appendix B).

(2) When the installation or activity is licensed by the NRC or is issued a DA Authorization to possess and use radioactive materials, the commander is also required to designate, in writing, a radiation control committee (unless specifically exempt) to review proposals for the use of radiation sources and to make recommendations concerning protective measures to be taken in accordance with AR 40-5, AR 40-14, AR 40-37, and AR 385-11.

b. Personnel Dosimetry Program.

(1) AR 40-14 prescribes radiation exposure limits, procedures and responsibilities for the control and recording of occupational exposure to sources of ionizing radiation.

(2) All DA personnel occupationally exposed to ionizing radiation are required to wear personnel monitoring devices (AR 40-14).

(3) The personnel dosimetry program and exposure records are reviewed and evaluated during each radiation protection survey conducted at the installation/activity for conformance with the procedures prescribed by AR 40-14 and AR 40-403.

(4) SB 11-206 prescribes the requisitioning, processing and disposal procedures for film and film holders used in the personnel monitoring program for radiation workers.

(5) AR 40-14 requires the investigation of all alleged overexposures to ionizing radiation.

c. Diagnostic X-Ray Protection Program.

(1) TB MED 521 (formerly TB MED 62) establishes policies, procedures, reporting requirements, and radiation protection practices related to the planning, acquisition, installation, calibration, maintenance, evaluation, and use of diagnostic and therapeutic x-ray and gamma-beam equipment. This bulletin implements those provisions of 21 CFR, Chapter 1, Subchapter J, which apply to diagnostic medical and dental x-ray systems and their major components. TB MED 521 also implements the Presidential guidance on radiation protection to Federal agencies for diagnostic x-rays promulgated in Title 3, CFR, Subchapter B (43 Federal Register 4377, 1 February 1978). TB MED 521 and TM 8-605 establish the frequency and tolerance to which diagnostic x-ray equipment is to be electrically/electronically calibrated.

(2) Selected enlisted personnel are given a 19-week basic course in radiographic techniques, safe operating procedures, and the nature of injuries resulting from overexposure to x-rays. The first or didactic phase of this course (13 weeks) is conducted at the Academy of Health Sciences, US Army, Fort Sam Houston, Texas. During the second phase (6 weeks), students are assigned to selected Army hospitals for supervised on-the-job training. Upon successful completion of this course, the students are assigned to radiology departments at installations and activities based upon the needs of the Army.

(3) Newly installed or modified x-ray facilities are surveyed at the request of the installation/activity commander soon after installation and prior to routine operation. Radiation surveys are normally performed every 2 years for medical facilities to be accredited by JCAH, and after every change in equipment, workload, or operating conditions which might significantly increase the probability of persons receiving exposures in excess of the radiation protection standards. In addition, special surveys are provided, as needed, by USAEHA or qualified assigned personnel (AR 40-5).

(4) The radiation protection survey is made to determine the compliance of the x-ray system with the performance standards, and is an evaluation of existing or potential radiation hazards associated with the use of diagnostic x-ray equipment (TB MED 521).

(5) Maintenance, repair, and modifications of x-ray systems are usually performed by Army biomedical equipment maintenance personnel, or may be performed by a representative of the manufacturer. Selected Army enlisted personnel are trained in x-ray maintenance procedures at the US Army Medical Equipment and Optical School, Denver, Colorado.

(6) Medical centers and most of the Army hospitals have several of each type of x-ray system described in TB MED 521. The Chief of the Radiology Department is responsible to the commander for promulgating the radiological safety rules for his department, including restrictions in operating techniques required to assure safe utilization of equipment. A Biomedical Equipment Maintenance Section is normally assigned to the MEDCEN/MEDDAC for continuing support.

(7) Only one or two x-ray systems are normally located at small health clinics and Armed Forces Examining and Entrance Stations. The examining physician is responsible for assuring the safe utilization of x-ray equipment. Medical maintenance for these type activities is provided by the Biomedical Equipment Maintenance Section of the MEDDAC to which they are assigned or by maintenance or service contract with the manufacturer of the equipment.

(8) The shielding requirements for diagnostic x-ray installations are established in TB MED 521; however, additional guidance is contained in TM 5-805-12 and CEGS-13750.

(9) Medical materiel complaints involving standard and nonstandard x-ray and ancillary equipment should be made in accordance with AR 40-61.

(10) The US Army Medical Department (AMEDD) is participating in two programs sponsored by the Bureau of Radiological Health (BRH), FDA. USAEHA coordinates the Army implementation of the Nationwide Evaluation of X-Ray Trends (NEXT) and Breast Exposure: Nationwide Trends (BENT) programs. In the near future, AMEDD will be participating in the Dental Exposure Normalization Technique (DENT) Program. The Health Physics Division collects, consolidates, reviews and transmits NEXT and BENT survey forms to BRH for analysis and then forwards the results to the installation/activity (TB MED 521).

d. Therapeutic X-Ray and Gamma-Beam Protection Program.

(1) AR 40-37 and TB MED 521 provide guidance for the design recommendation, performance standards, and guidelines for the safe use of therapeutic x-ray and gamma-beam equipment.

(2) Therapeutic x-ray and gamma-beam equipment in the Army are located only in the Medical Centers. Operators are usually registered x-ray technologists working under the supervision of a board-certified radiologist. Normally, a radiological physicist (SSI 68B) is assigned to the radiation therapy facility.

(3) Therapeutic x-ray and gamma-beam facilities are normally surveyed annually by USAEHA personnel during the regularly scheduled HSC-IG. The equipment must be calibrated and output certified annually by a board-certified or board-eligible health physicist or radiological physicist (TB MED 521).

e. Industrial X-Ray Protection Program.

(1) National Bureau of Standards (NBS) Handbook 114 provides recommended safety standards for industrial x-ray facilities.

(2) Industrial type x-ray systems are located at most research and development type activities and are often found in logistical activities where quality assurance and nondestructive testing operations are conducted.

(3) The use of these x-ray systems is restricted to personnel who have had adequate on-the-job training with the specific x-ray system to assure its safe operation.

f. Particle Accelerator Protection Program.

(1) NBS Handbooks 55 and 107 provide recommendations for protection requirements for high-energy accelerators. NCRP Report No. 51 provides radiation protection design guidelines for 0.1-100 megaelectronvolts (MeV) particle accelerator facilities.

(2) Particle accelerators are located mainly in DARCOM logistical or research activities where quality assurance and nondestructive testing operations are performed.

(3) The use of these accelerators is restricted to personnel who have had adequate on-the-job training with the specific accelerator to assure its safe operation.

g. X-Ray Diffraction and Fluorescence Analysis Equipment Protection Program.

(1) NBS Handbooks 111 and 114 provide recommendations on the radiation safety requirements for x-ray diffraction and fluorescence analysis equipment.

(2) X-ray diffraction and fluorescence analysis equipment have become major tools in research and quality control programs.

h. Radioactive Commodity Management, Maintenance, Repair and Storage Protection Program.

(1) AR 700-64 establishes the general policies and procedures applicable to procurement, receipt, handling, maintenance, storage and disposal of radioactive commodities.

(2) TB MED 522 (formerly TB MED 232), TB 700-3, and SB 740-1 prescribe requirements for the safe handling, storage and disposal of self-luminous devices containing radioactive material.

(3) TB 43-0108, TB 43-0114, TB 43-0122, TB 43-0141, TB 43-0143, and TB 43-0197 identify radioactive commodities, other than nuclear weapon components, in the Army supply system. In addition, general policies and procedures are provided to assure life-cycle control of radioactive commodities.

(4) Maintenance manuals, technical manuals, technical bulletins and local standing operating procedures provide specific guidance for minimizing and controlling health hazards associated with operations for the specific items concerned.

(5) Plans and specifications for new items containing radioactive materials are submitted to the Office of The Surgeon General (DASG-PSP-E) for review of possible health hazards before the item is type classified (AR 385-11 and AR 700-64). Many of these items are evaluated by USAEHA during the test and evaluation phases.

i. Radioisotope Protection Program.

(1) The general procedures for the control of radioactive materials are prescribed in AR 40-37 and AR 385-11; AR 40-37 prescribes policies and procedures for the control and use of radioactive materials for medical purposes; and AR 385-11 prescribes policies and procedures for the control of radioactive material for nonmedical purposes.

(2) AR 385-30 specifies the requirement for posting areas where radioactive materials are used and stored.

(3) AR 385-40 delineates the requirements and procedures for reporting radiation accidents and incidents.

(4) AR 340-18-6 describes the radiation protection program files and prescribes their retention period and disposition.

(5) AR 200-1 requires the annual status report of radiation sources and protective measures.

(6) AR 200-1 and AR 200-10 implement the National Environmental Policy Act requirements.

(7) AR 360-5 provides guidance for the release of information concerning radiation accidents/incidents.

(8) AR 40-13 prescribes the establishment, mission and functions of the radiological advisory medical team (RAMT). The RAMT is available to assist and furnish guidance to the on-scene commander or other responsible officials at the accident site and to local medical authorities concerning radiological health hazards.

(9) Radioactive decontamination procedures and techniques are contained in TB MED 522, TM 3-220, and NCRP Reports Number 8 and 65.

(10) Installations and activities which have been issued an NRC license(s) or DA radiation authorization(s) are surveyed by USAEHA for conformance with the conditions of the license or authorization and other applicable directives for radiation protection. Nuclear medicine clinics which use radioactive materials in humans are surveyed annually. The Office of Inspection and Enforcement of the NRC also inspects the facilities possessing NRC license(s) at periodic intervals.

(11) Some of the NRC licenses and DA radiation authorization(s) issued to specific organizations authorize the distribution and use of certain sources throughout the Army (i.e., Standard Calibration and Test Sources, Corps of Engineer Density and Moisture Gauges, Civil Defense Radiac Training Sets).

j. Nuclear Reactor Protection Program.

(1) AR 385-80 assigns responsibilities and provides instruction for the establishment and direction of an Army-wide nuclear reactor systems health and safety effort. Currently, the Army has two operational research reactors.

(2) AR 50-5 establishes policies and procedures to insure that only those individuals who meet high standards of suitability are assigned to nuclear reactor duty positions. HSC Regulation 40-14 describes the medical support role in the nuclear surety program.

(3) Nuclear fuel used in a nuclear reactor that is exempt from NRC licensing in accordance with Section 91B, PL 83-703, of the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, is procured, possessed, and controlled in accordance with AR 700-25.

(4) AR 40-501 and TB MED 267 provide guidance for the medical evaluation for personnel in the Army nuclear power program.

(5) The DA Inspector General inspects and reports on the technical, health physics, and safety aspects of the operation of nuclear reactors on an annual basis in accordance with AR 20-1, AR 385-80 and TB IG 5. USAEHA makes available a health physicist, on a temporary basis, during the period of the inspection for inspecting the health physics aspects and the environmental monitoring program associated with a nuclear reactor facility.

k. Radioactive Waste Disposal. AR 385-11 and TM 3-261 provide policy and instructions for the temporary storage, shipment, and disposal of unwanted radioactive material or radioactive commodities. AR 200-1 and AR 385-11 provide policy on the release of radioactive effluents to the environment.

l. Transportation of Radioactive Materials. AR 385-11, TM 55-315, and TM 55-4470-400-12 prescribe policies and responsibilities, and furnish guidance beyond that provided by the Department of Transportation (DOT) for the safe transportation of radioactive materials other than nuclear weapons. Reporting of packaging and handling deficiencies are prescribed in AR 735-11-2. Discrepancies in shipments will be reported in accordance with AR 55-38.

m. Calibration of Radiation Detection Instruments. AR 40-37 and TB 43-180 require that all radiation survey instruments used in the radiation protection program for ionizing radiation sources be calibrated every 3 months and after each maintenance action or battery change. TB 750-242-3 requires that pocket dosimeters used in the radiation protection program be inspected and certified every 6 months. Title 42 CFR 74.27 requires that counting equipment used in a Nuclear Medicine Clinic be calibrated each day the equipment is used, and the results recorded. (NOTE: DARCOM is proposing to calibrate x- and gamma-ray survey instruments on a 180-day cycle, except those instruments used for gamma radiography, alpha, and neutron surveys. These instruments will still be on a 90-day frequency until sufficient data are collected and evaluated.)

B. Laser Microwave Division.

1. Field Services. Provides routinely scheduled field surveys and, upon request, training and special studies of sources of nonionizing radiations, ultrasonic, and magnetic fields. Field services are provided world-wide with prior approval of The Surgeon General for OCONUS surveys and the Commander, HSC, for CONUS surveys. Two types of surveys are performed at 3-year intervals.

a. Laser and high intensity light source surveys include an evaluation of the laser equipment, operations, and laser range facilities; and the evaluation of other high intensity optical sources, such as ultraviolet lamps, high intensity searchlights, and high intensity infrared-emitting equipment.

b. Microwave/RF surveys include microwave radar and communications systems, microwave ovens, and diathermy units (including ultrasound).

c. Evaluation of magnetic field generating equipment is accomplished on a limited basis depending upon the type of equipment and availability of adequate instrumentation.

2. Reports. Findings and recommendations for eliminating or controlling potential nonionizing health hazards and recommended administrative procedures are provided in the radiation protection survey report of each installation/activity surveyed. These reports are forwarded through command channels to the installation/activity commander.

3. Training. In addition to continuous on-the-job training for USAEHA personnel, short formal courses and workshops are presented by USAEHA. Personnel from USAEHA may assist in radiological hygiene training programs as they pertain to nonionizing radiation sources for safety and supply personnel at DLA activities and other personnel responsible for radiological hygiene in the Army.

4. Nonionizing Radiation Protection Standards and Criteria.

a. Laser Radiation Protection Program.

(1) AR 40-46 describes procedures and responsibilities for the control and recording of occupational exposure to sources of laser radiation. Laser radiation protection standards are provided in this regulation.

(2) TB MED 279 provides guidance to persons who use laser equipment and to others who may have a responsibility for its safe use. It recommends operational procedures, personnel controls and administrative procedures which will contribute to minimizing the needless exposure of personnel to optical radiation from lasers.

(3) AR 40-418 and AR 385-40 prescribe procedures for reporting laser radiation accidents.

b. Non-Laser Optical Radiation Protection Program.

(1) AR 40-46 prescribes procedures and responsibilities for the control of occupational exposure to all sources of optical radiation. It provides ultraviolet radiation protection standards, but does not provide standards for protection of personnel against visible and infrared searchlights, electric-arc lamps, non-laser infrared illuminators, optical missile guidance sources, and similar equipment. The USAEHA evaluates such sources based upon tentative standards which cannot be reduced to simplified tabulation.

(2) Hazard Control Procedures for Specific Equipment. In the absence of specific optical radiation protection standards, guidance for the control of hazards from specific optical equipment is provided in special studies published by USAEHA. These studies are available from the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314.

c. Microwave/RF Radiation Protection Program.

(1) AR 40-583 provides radiation protection standards for microwave/RF radiation and provides procedures and responsibilities for the control of occupational exposure to microwave radiation.

(2) TB MED 523 (formerly TB MED 270) provides guidance to persons who use microwave/RF equipment and to others who may have a responsibility for its safe use. It recommends operational procedures, personnel controls, and administrative procedures which will contribute to minimizing needless exposure of personnel. In addition, it provides general guidance in the area of electromagnetic interference (EMI) with medical electronic devices. Specific guidance and assistance for EMI problems is available from the Laser Microwave Division, USAEHA (ATTN: HSE-RL). A discussion of diagnostic ultrasound applications is also included, although no standards have been promulgated as of this date.

(3) AR 40-44 specifies the Microwave Oven Radiation Protection Program established for the Army and procedures necessary to carry out such a program.

(4) AR 40-418 and AR 385-40 prescribe procedures for reporting microwave/RF accidents or alleged overexposures.

VII. CONCLUSION. There is a continuing need for command emphasis on radiation protection. Major deficiencies noted are lack of adequately trained personnel and lack of resources.

NOTE: AR 40-5, AR 40-14, TB MED 521, TB MED 522, and TB MED 523 are currently at OTSG for either publication or staffing.

APPENDIX A

REFERENCES

1. AR 10-5, Department of the Army, 1 November 1978.

2. AR 10-43, US Army Health Services Command, 15 January 1980.

3. AR 20-1, Inspector General Activities and Procedures, 15 June 1978.

4. AR 40-5, Health and Environment, 25 September 1974.

5. AR 40-7, Use of Investigational Drugs in Humans and the Use of Schedule I Controlled Drug Substances, 4 April 1975.

6. AR 40-14, Control and Recording Procedures for Occupational Exposure to Ionizing Radiation, 20 May 1975.

7. AR 40-37, Licensing and Control of Radioactive Materials for Medical Purposes, 7 January 1977.

8. AR 40-38, Clinical Investigation Program, 23 February 1973.

9. AR 40-44, Control of Potential Hazards to Health from Microwave Cooking Ovens and Other Microwave/Radio Frequency (RF) Food Service Devices, 31 March 1977.

10. AR 40-46, Control of Health Hazards from Lasers and Other High Intensity Optical Sources, 6 February 1974.

11. AR 40-61, Medical Logistics Policies and Procedures, 25 February 1976.

12. AR 40-403; Health Records, 20 November 1973.

13. AR 40-418, Medical Statistical Reporting, 16 August 1976.

14. AR 40-501, Standards of Medical Fitness, 5 December 1960.

15. AR 40-583, Control of Potential Hazards to Health from Microwave and Radio Frequency Radiation, 14 August 1975.

16. AR 50-5, Nuclear Surety, 1 September 1978.

17. AR 55-38, Reporting of Transportation Discrepancies in Shipments, 4 August 1977.

18. AR 70-1, Army Research, Development and Acquisition, 1 May 1975.

19. AR 70-10, Test and Evaluation During Development and Acquisition of Materiel, 29 August 1975.

20. AR 70-25, Use of Volunteers as Subjects of Research, 31 July 1974.

21. AR 200-1, Environmental Protection and Enhancement, 20 January 1978.

22. AR 200-10, Army Environmental Program, 28 December 1976.

23. AR 340-18-6, Maintenance and Disposition of General Personnel Management and Safety Functional Files, 14 August 1969.

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26. AR 385-30, Safety Color Code Markings and Signs, 18 November 1971.

27. AR 385-40, Accident Reporting and Records, 15 August 1972.

28. AR 385-80, Nuclear Reactor Health and Safety Program, 20 December 1973.

29. AR 700-25, Nuclear Reactors, Authorization and Accounting of Utilization Facilities and Special Nuclear Material for Use Therein, 29 August 1969.

30. AR 700-64, Radioactive Commodities in the DoD Supply Systems, 18 November 1976.

31. AR 735-11-2, Reporting of Item Discrepancies Attributable to Shippers, February 1980.

32. AR 740-26, Physical Inventory Control, 6 August 1975.

33. Title 3, Code of Federal Regulations (CFR), 1979 ed., Presidential Documents other than Proclamations and Executive Orders, Subchapter B, Administrative Orders, Radiation Protection Guidance to Federal Agencies for Diagnostic X-Rays.

34. Title 10, CFR, 1980 ed., Part 20, Standards for Protection Against Radiation.

35. Title 21, CFR, 1979 ed., Chapter I, Subchapter J, Radiological Health.

36. Title 21, CFR, 1979 ed., Part 310, New Drugs.

37. Title 21, CFR, 1979 ed., Part 312, New Drugs for Investigational Use.

38. Title 21, CFR, 1979 ed., Part 314, New Drug Applications.

39. Title 21, CFR, 1979 ed., Part 361, Prescription Drugs for Human Use Generally Recognized as Safe and Effective Not Misbranded: Drugs Used in Research.

40. Title 21, CFR, 1978 ed., Part 601, Licensing.

41. Title 29, CFR, 1979 ed., Section 1910.96, Ionizing Radiation.

42. Title 29, CFR, 1979 ed., Section 1910.97, Nonionizing Radiation.

43. Title 42, CFR, 1979 ed., Section 74.27, Radiobioassay.

44. PL 83-703, Atomic Energy Act of 1954, as amended, 30 August 1954.

45. PL 93-438, Energy Reorganization Act of 1974, as amended, 11 October 1974.

46. TB MED 267, Gidelines for Medical Evaluation of Applicants and Personnel in Army Nuclear Power Program, 11 February 1963.

47. TB MED 279, Control of Hazards to Health from Laser Radiation, 30 May 1975.

48. TB MED 521, Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma Beam Equipment (in preparation).

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50. TB MED 523, Microwave Radiation (in preparation).

51. TB IG-5, Technical Proficiency and Reactor Facility Inspection, 4 December 1975.

52. TB 43-180, Calibration Requirements for the Maintenance of Army Materiel, 20 August 1979.

53. TB 43-0108, Handling, Storage and Disposal of Army Aircraft Components Containing Radioactive Materials, 2 February 1979.

54. TB 43-0116, Identification of Radioactive Items in the Army Supply System, 21 September 1973.

55. TB 43-0122, Instructions for Safe Handling and Identification of USA Electronics Command Managed Radioactive Items in the Army Supply System, 1 August 1974.

56. TB 43-0141, Instructions for Safe Handling, Maintenance, Storage, and Disposal of Radioactive Commodities Managed by US Army Troop Support and Aviation Materiel Command (Excluding Aircraft Components), 5 December 1973.

57. TB 43-0143, Handling, Storage, Shipping and Disposal of Surge Voltage Protector Tubes (Spark Gap Tubes), 25 April 1980.

58. TB 43-0197, Instructions for Safe Handling, Maintenance, Storage, and Disposal of Radioactive Items Managed by US Army Armament Command, 10 June 1977.

59. TB 700-3, Handling, Storage and Disposal of Self-Luminous Devices, 8 August 1968.

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61. SB 11-206, Film Badge (Photodosimetry) Supply and Service for Technical Radiation Exposure Control, 18 April 1969.

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64. TM 3-261, Handling and Disposal of Unwanted Radioactive Material, 20 May 1966.

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70. NBS Handbook 107, Radiological Safety in the Design and Operation of Particle Accelerators, 25 July 1978.

71. NBS Handbook 111, Radiation Safety for X-Ray Diffraction and Fluorescence Analysis Equipment, 12 August 1977.

72. NBS Handbook 114, General Safety Standards for Installations Using Nonmedical X-Ray and Sealed Gamma-Ray Sources, February 1975.

73. NCRP 8, Control and Removal of Radioactive Contamination in Laboratories (1951)

74. NCRP 51, Radiation Protection Design Guidelines for 0.1-100 MeV Particle Accelerator Facilities (1977)

75. NCRP 65, Management of Persons Accidentally Contaminated with Radionuclides (1979)

76. CEGS-13750, Corps of Engineers Guide Specification X-Ray Shielding, May 1977.

77. HSC Reg 10-1, Organization and Functions Policy, 1 November 1978.

78. HSC Reg 40-14, Medical Support - Nuclear and Chemical Personnel Reliability Programs, 13 September 1979.

79. HSC Suppl 1 to AR 40-5, Health and Environment, 5 October 1976.

APPENDIX B

RADIATION PROTECTION OFFICER

1. The Radiation Protection Officer (RPO) is an individual designated by the commander to provide consultation and advice on the degree of hazards associated with radiation and the effectiveness of the measures to control these hazards; and to supervise the radiation protection program.

2. Organizationally, the RPO will be in a position where he can effectively advise the commander and the radiation workers on all matters pertaining to radiation protection.

3. Responsibilities of the RPO will include, but not be limited to:

a. Providing the commander, radiation control committee and radiation workers with advice and assistance on all matters pertaining to radiation protection. This includes instructing and training of workers (users) and visitors in the safe use of protective equipment and radiation producing devices (AR 40-5, AR 40-14 and AR 40-37).

b. Providing guidance on types of protective clothing and equipment required and its proper use (AR 40-5 and TB MED 522).

c. Reviewing operations to determine compliance with regulations and approved procedures (AR 40-37 and AR 385-11).

d. Reviewing standing operating procedures (SOP) for operations involving sources of radiation prior to review by the radiation control committee (AR 40-5 and AR 40-37).

e. Assuring that proper personnel monitoring devices are used and that required records are maintained of the results (AR 40-5 and AR 40-14).

f. Assuring that radiation detection instruments are properly calibrated and are available to radiation workers (AR 40-5 and TB 43-180).

g. Assuring that all radiation shields, containers and handling equipment are maintained in satisfactory condition (AR 40-5).

h. Assuring the proper posting of any radiation warning signs (AR 385-30).

i. Maintaining a current inventory of radioactive materials and a registry of radiation producing devices (AR 40-5, AR 40-37, AR 40-44, AR 40-46, AR 40-583, AR 385-11 and TB MED 521).

j. Maintaining the required radiation protection records (AR 340-18-6).

k. Conducting a physical inventory of radioactive materials at least once every 12 months (AR 385-11 and AR 740-26). For medical facilities the inventory shall be performed at least once every 3 months (AR 40-37).

l. Performing radiation surveys and leak tests, or assuring such surveys and tests are performed. The accuracy of tests and surveys, if performed by others, remains the responsibility of the RPO (AR 40-37 and AR 385-11). All nonionizing radiation surveys, excluding microwave oven surveys performed by qualified personnel, will be performed by appropriate USAEHA survey officers who retain responsibility for their accuracy (AR 40-583, AR 40-44 and AR 40-46).

m. Evaluating the hazard potential and adequacy of protective measures for existing and proposed operations (AR 40-5).

n. Monitoring incidents wherein unusual levels of radiation or radioactive contamination are suspected (AR 40-5 and AR 40-37).

o. Insuring that all radioactive materials are properly used, stored, handled, shipped and disposed of in accordance with existing guidance (AR 40-5, AR 40-37, and AR 385-11).

p. Advising the appropriate radioactive material control point of any forthcoming change in accountability, RPO or installation relocation of an individually controlled item containing radioactive material (AR 385-11).

q. Implementing the radiation protection program (AR 40-5 and AR 40-37).

r. Investigating radiation accidents/incidents and overexposures to determine the cause and taking steps to prevent recurrence (AR 40-5 and AR 40-14) and, in the case of microwave/RF or laser overexposures, insure that an appropriate report is forwarded (AR 40-418).

s. Terminating a project or procedure involving the use of radioactive material or radiation producing device which is found to be a threat to health or property (AR 40-37).

t. Conducting periodic surveillance programs and investigations to insure that occupational radiation exposures are maintained as low as is reasonably achievable (AR 40-14).

u. Communicating directly with the appropriate staff personnel and taking necessary corrective action to enforce rules and procedures pertaining to the radiation protection program (AR 40-37 and AR 385-11).