



DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WALTER REED HEALTH CARE SYSTEM
WASHINGTON, DC 20307-5001

RECEIVED
REGION I

REPLY TO
ATTENTION OF

October 15, 2001

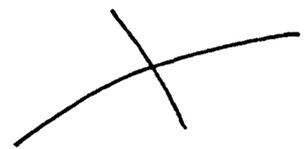
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NMSB2

Preventive Medicine Service

Nuclear Regulatory Commission, Region I
Medical Licensing Division
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

08-01738-03
030-06895



Dear Sir or Madam:

Walter Reed Army Medical Center uses radioactive material authorized by U.S. Nuclear Regulatory Commission (NRC) Irradiator License number 08-01738-03 with an expiration date of November 30, 2001.

We request to renew NRC License 08-1738-03 in its entirety. NRC Form 313 with attachments is enclosed for your review.

For any additional information, please contact the undersigned at (202) 356-0058.

Sincerely,

William B. Johnson
William B. Johnson
Colonel, U.S. Army
Radiation Protection Officer

Copy Furnish:
Director, Proponency Office for Preventive Medicine - San Antonio,
ATTN: MCPO-SA (COL Daxon), 2050 Worth Road, Ft. Sam Houston, TX
78234-6000

II/2

Information in this record was deleted
in accordance with the Freedom of Information Act

246
8-0237

130465

NMSS/RGNI MATERIALS-002

William B. Johnson

(8-1999)
10 CFR 30, 32, 33
34, 35, 36, 39 and 40

Estimated burden per response to comply with this mandatory information collection request 7.4 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records Management Branch (T-8 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

LICENSING ASSISTANT SECTION
NUCLEAR MATERIALS SAFETY BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

SAM NUNN ATLANTA FEDERAL CENTER
U. S. NUCLEAR REGULATORY COMMISSION, REGION II
61 FORSYTH STREET, S.W., SUITE 23T85
ATLANTA, GEORGIA 30303-8931

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
801 WARRENVILLE RD.
LISLE, IL 60532-4351

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-8064

030-06895
~~X~~

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR (Check appropriate item)

- A. NEW LICENSE
- B. AMENDMENT TO LICENSE NUMBER _____
- C. RENEWAL OF LICENSE NUMBER 08-01738-03

2. NAME AND MAILING ADDRESS OF APPLICANT (Include Zip code)

Department of the Army
Walter Reed Army Medical Center
Bldg 41, Room 38
Washington, DC 20307

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED
Walter Reed Army Medical Center, Washington, DC 20307
Walter Reed Army Institute for Research, Forest Glen Annex
Silver Spring, MD 20910

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

COL William Johnson

TELEPHONE NUMBER
(202) 356-0058

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.	6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.
7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.	8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.
9. FACILITIES AND EQUIPMENT.	10. RADIATION SAFETY PROGRAM.
11. WASTE MANAGEMENT.	12. LICENSEE FEES (See 10 CFR 170 and Section 170.31) FEE CATEGORY _____ AMOUNT ENCLOSED \$ _____

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39 AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE Henry K. Jung, MAJ, MS, Executive Officer	SIGNATURE <i>Henry K. Jung</i>	DATE 15 Oct 01
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FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED \$	CHECK NUMBER	COMMENTS
APPROVED BY				DATE	130465

We will use instruments that meet the radiation monitoring instruments specifications published in Appendix K to NUREG-1556, Vol 5, 'Consolidated Guidance about materials Licenses: Program-Specific Guidance about Self-Shielded Irradiator Licenses', dated June 1998. Additionally, each survey meter will have been calibrated by the manufacture or other person authorized by the NRC or an Agreement State to perform survey meter calibrations no more than 12 months before the date the meter is used.

Physical inventories will be conducted at intervals not to exceed 6 months, to account for all sealed sources and devices received and possessed under the license.

If we change our operating and emergency procedures without amending our license, we will ensure that: the changes are reviewed and approved by licensee management and the RSO; affected license staff are trained in the procedures before they are implemented; the changes are consistent with applicable license conditions and the procedures or commitments submitted in the license application; and the changes do not degrade the safety of the program. Operating and emergency procedures will be developed, implemented, maintained, and distributed and will meet the Criteria in the section entitled 'Radiation Safety Program, Operating and Emergency Procedures' in NUREG-1556, Vol 5, 'Consolidated Guidance about materials Licenses: Program-Specific Guidance about Self-Shielded Irradiator Licenses', dated June 1998

We will implement and maintain procedures for routine maintenance of our self-shielded irradiators according to each manufacture's written recommendations and instructions. We will have the self-shielded irradiator manufacture or other person authorized by NRC or an Agreement State perform non-routine maintenance.

11. WASTE MANAGEMENT.

Disposal of the licensed material in the irradiators will be accomplished by transferring the irradiators to the supplier or to a licensee specifically authorized to accept it.

12. LICENSE FEES

Fee category	7B	Amount Enclosed	Exception (10CFR 170.11(a)(5))
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5. EXPERIENCE WITH RADIATION.(Actual use of Radioisotopes or Equivalent Experience)				
ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE GAINED	DURATION OF EXPERIENCE	TYPE OF USE
²³⁵ U ²³⁸ U ²³⁹ Pu Pu-Be ²⁴¹ Am ¹³⁷ Cs ³ H	216 gm unsealed & soln. sources 3 gm unsealed source 43 gm, liquid sources 3 Ci, Sealed 600 mCi, Sealed 120 Ci, Sealed 110 Ci, Sealed	U.S. Army Environmental Hygiene Agency Aberdeen Proving Ground, MD NRC Byproduct Material License	June 1992 - May 1994 (2 years)	Health Physics Surveys; Principle User, Member of the Radiation Control Committee
Atomic No. 1-83 ¹³¹ I ¹³³ Xe ⁸⁵ Kr ³² P ¹⁴ C ¹²⁵ I ¹⁹² Ir ⁵¹ Cr ³⁵ S ³ H ⁹⁹ Mo ^{99m} Tc ⁹⁰ Sr ¹³⁷ Cs ¹⁵³ Gd ¹²⁵ I ¹²⁵ I ¹³⁷ Cs ⁶⁰ Co ²⁴¹ Am ⁶³ Ni ¹²⁹ I ¹⁰³ Pd Thorium Uranium Depleted U ¹³⁷ Cs	400 mCi each not to exceed 26 Ci. 2 Ci; any form 2 Ci; any form 1 Ci; any form 2 Ci; any form 2 Ci; any form 1 Ci; any form 1 Ci; any form 0.75 Ci; any form 1 Ci; any form 5 Ci; any form 23 Ci Generators 23 Ci; any form 0.5 Ci; sealed 2 Ci; sealed 2 Ci; sealed 1 Ci; seeds 1.2 Ci; sealed 1.2 Ci; sealed 0.5 Ci; sealed 20.5 Ci; sealed 1 Ci; sealed; foils 1 Ci; sealed 3 Ci; sealed 5 kg; any 50 kg; any 400 kg; Plated 83,200 Ci; 3 irradiators	Walter Reed Army Medical Center, Washington, D.C. Radiation Safety Officer for Broad Scope Type A, NRC Byproduct License (Medical Human Use and Non Human Use) No. 08-01738-02 and USNRC BML No. 08-01738-03 for irradiators.	May 1994 to Present	RSO, Chief Health Physics, Health Physics Surveys, Iodinations, Calibrations, Dosimetry, and Bioassay; Manager of complete Radiation Safety Program.

CURRICULUM VITAE

COL WILLIAM B. JOHNSON, Ph.D, Medical Service Corps, US Army

Address:

Residence:

[REDACTED]

Phone: [REDACTED]

Work:

Walter Reed Army Medical Center
Chief, Health Physics Office
Washington D.C. 20307-5001
Phone: (202) 356-0058

ACADEMIC AREAS OF INTEREST:

Medical Physics, Health Physics, Optimizing Medical Images, Quality Control in Radiology, Mammography, Computers, Public Health

EDUCATION AND TRAINING:

CIVILIAN TRAINING:

University Training:

University of North Carolina, Chapel Hill, NC, Ph.D., Radiological Hygiene & Medical Physics [] Ex 6

Tulane School of Public Health and Tropical Medicine, New Orleans, LA, MPH, Environmental Health [] Ex 6

Iowa State University, Ames, IA, BS, Mathematics, [] Ex 6

Short Courses and Continuing Education:

Digital Mammography Training Program, Northwestern University Medical School, Chicago, IL, 8 hours, 20 June 2001.

Radiological WMD Workshop & Tabletop Exercise, District of Columbia Emergency Management Agency, 8 hours, 27 April 2000.

Ionizing Radiation Science & Protection in the 21st Century, NCRP 36th Annual Meeting, Arlington, VA, 5-6 April 2000.

Emerging Issues in Mammography, University of Virginia School of Medicine, Charlottesville, VA, 24-25 September 1999, 15 hours.

**PERSONAL INFORMATION WAS REMOVED
BY NRC. NO COPY OF THIS INFORMATION
WAS RETAINED BY THE NRC.**

Curriculum Vitae William B. Johnson

American Academy of Health Physics Courses, Philadelphia, PA, June 1999
MARSSIM for Managers - 16 Continuing Education Credits (CECs);
Compliance with the Final MQSA Regulations-A Primer for Physicists - 4 CECs;
Final Status Surveys Using MARSSIM Process - 4 CECs;
Health Physics for Research Reactors - 4 CECs;
Putting MARSSIM to Work I - 4 CECs;
University & Medical Radioactive Waste Management - 4 CECs;

Radiation Protection in Medicine: Contemporary Issues, NCRP 35th Annual Meeting,
Arlington, VA, 7-8 April 1999.

American Academy of Health Physics Courses, San Antonio, TX, July 1997:
In Vivo Measurement of Internally Deposited Radionuclides - 16 Continuing
Education Credits (CECs);
MQSA Procedures & Impact on Mammography Practice - 4 CECs;
Basic Local Exhaust Ventilation for Health Physicists - 4 CECs;
Demystifying Internal Dose Calculations - 4 CECs;
Current Approaches to Regulation Public Radiation Exposures - 4 CECs;
University & Medical Radioactive Waste Management - 4 CECs;
Mitigating Radiation Dose To Patient and Staff - 4 CECs.

X-Ray Mammography, Basic Physics & Quality Assurance, University of Texas
Health Science Center, San Antonio, TX, January 1997, 16 hours.

American College of Radiology's Mammographic Image Quality Course: Role of
the Medical Physicist, January 1994, Cincinnati, Ohio, 18 CME credits awarded.

Radiological Society of North America (RSNA) 78th Meeting: Technical Aspects of
Breast Imaging; Accreditation/QC; Specification, Medical Physics Testing, Physics Forum,
6.0 CME credits awarded, 1992.

Radiological Society of North America (RSNA) 77th Meeting, Technical Aspects &
Quality Control in Mammography, 1.5 CME credits awarded, 1991.

International Society for Optical Engineering Medical Imaging V Meeting, San Jose,
CA, 1 week, 1991.

MRI Acceptance Testing and Quality Control, The Bowman Gray School of
Medicine, Winston-Salem, NC, 1 week, 1988.

Curriculum Vitae William B. Johnson

Health Physics In Radiation Accidents, Oak Ridge Associated Universities, Oak Ridge, TN, 1 week, 1985.

Health Physics Aspects of Nuclear Attack, Health Physics Summer School, Louisiana University, Hammond, LA, 1 week, 1984.

Electronic Imaging in Medicine, University of Texas at San Antonio, TX, 1 week, 1983.

Ionizing and Nonionizing Radiation in Medicine, University of Pennsylvania, Philadelphia, PA, 1 week, 1979.

Medical X-Ray Protection Course, USPHS, Rockville, MD, 2 weeks, 1973.

MILITARY TRAINING:

Army Medical Department Radiation Health Sciences Course, US Army Center for Health Promotion and Preventive Medicine, APG, MD, 1 week, 1994, 1995, 1996, 1997, 1998, 1999.

Association of Military Surgeons of the United States (AMSUS) 104th Annual Meeting, Chemical, Biological and Radiation Threats: A Challenge for Federal Medicine, 61-21 November 1997, 32 hours.

Medical Physics and Military Medicine, US Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD, 1 week, 1983, 1985, 1987, 1988, 1989, 1991, 1993.

Medical Effects of Nuclear Weapons, Armed Forces Radiobiology Research Institute, Bethesda, MD, 1 week, 19-23 September 1983.

Faculty Development Course, Academy of Health Sciences, Ft. Sam Houston, TX, 4 weeks, 1976.

Command and General Staff Officer Course (Correspondence Option), 1 year, 1987.

AMEDD Officer Advanced Course, Ft. Sam Houston, TX, 24 weeks, 1975.

AMEDD (MSC) Officer Basic Course, Ft. Sam Houston, TX, 9 weeks, 1972

Curriculum Vitae William B. Johnson

Nuclear Power Plant Operator Course (Health Physics Specialty), Ft. Belvoir, VA, 1 year, 1971.

TEACHING EXPERIENCE:

1990-1993, Assistant Professor of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, Bethesda, MD.

1977-1979, Instructor, Radiological Physics, Academy of Health Sciences, Ft. Sam Houston, TX.

1977-1979, Assistant Professor of Health Sciences, Baylor University at San Antonio, San Antonio, TX.

1969-1970, High School Teacher (Mathematics), Grant Community High School, Fox Lake, IL.

PROFESSIONAL EXPERIENCE:

1. April 1995 to Present, Radiological Hygiene Consultant to The U.S. Army Surgeon General and Nuclear Medical Science Officer Consultant to the Chief, Medical Service Corps.

Duties: Provide policy and regulatory guidance to The Surgeon General (TSG) for all radiological hygiene issues as requested by TSG. Policies and guidance are used world wide by all U.S. Army Medical Units. Provides guidance to all Army Commands related to occupational exposure to ionizing radiation, radiation hazard analysis of all end-items used by soldiers containing radioactive material, and environmental exposures. Coordinates and participates with U.S. National and International Organizations (such as the National Council on Radiation Protection) as the TSG representative. As the Nuclear Medical Science Officer (NMSO) Consultant, provides career guidance to 60 officers including programing assignments, sponsoring professional short courses, and coordinating and approving graduate training for MS and PhD. programs.

1a. May 1994 to Present, Chief, Health Physics Office, Walter Reed Army Medical Center, Washington, D.C.

Duties: Lead and manage the Health Physics Office composed of three technical branches and an administrative section. Directs the activities of 20 professionals in support of a two Nuclear Regulatory Commission Medical Byproduct Material Licenses, and is the Radiation Safety Officer. Institutions included on the NRC license include Walter Reed

Curriculum Vitae William B. Johnson

Army Medical Center, the Armed Forces Institute of Pathology, and Walter Reed Institute of Research. In addition, provides direct medical physics support in support of mammography, computed tomography, and magnetic resonance imaging. Support of mammography includes medical physics acceptance testing of all new mammography systems, annual medical physics surveys to support American College of Radiology Accreditation, and providing support in review of all quality assurance issues. Extensive mammography support includes operations at Walter Reed Army Medical Center and at all Army Community Hospitals and Health Clinics in the Walter Reed Region. Currently providing direct services to ten mammographic facilities to meet ACR requirements for accreditation.

2. June 1992 to April 1994, Chief, Health Physics Division, U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

Duties: Leads and manages the Health Physics Division composed of the Medical Health Physics Branch, the Industrial Health Physics Branch and an Administrative Section. Directs the activities of some 25 professional health physicists in world wide mission of support of U.S. Army Radiation Protection Programs. Support includes complete radiation protection program evaluations for compliance with Federal, Army, and Nuclear Regulatory Commission (NRC) Licenses for Medical and Industrial facilities, medical and industrial x-ray surveys, radiation dose assessments from bioassay data, assistance in preparation of documents to terminate NRC licenses, and conducting verification surveys for NRC License termination. Radiation protection policies are developed for the Army Surgeon General for implementation Army wide. Act as Army Surgeon General consultant on ACR Mammography Accreditation for all Army Medical Treatment facilities. Provide training to survey officers on acceptance testing of mammographic systems, and train individuals on ACR mammography requirements. Act as principle user of radioactive materials, supervisor of ^{137}Cs irradiator for calibration, and member of the Radiation Control Committee.

3. June 1989 to June 1992, Deputy Director, Environmental Health and Occupational Safety; Chief, Radiation Safety and Radiation Protection Officer, Uniformed Service University of the Health Sciences (USUHS), Bethesda, MD.

Duties: Responsible for the supervision and management of broad scope US Nuclear Regulatory Byproduct Materials License No. 19-23344-01. Supervises health physics personnel in the performance of laboratory radiation protection surveys, personnel dosimetry program, laboratory analysis, and radioactive material control. Provides technical advice to some 350 radiation workers working in about 150 radioisotope laboratories. Teaches in various graduate level courses in Preventive Medicine and Radiology. Provides technical consultation to Director and other Branch Chiefs. Acts as the Director when the Director is absent. Has been designated the Medical Physics

Curriculum Vitae William B. Johnson

Consultant on acquisition and acceptance testing of Computerized Tomography (CT) Systems and Magnetic Resonance Imaging (MRI) Systems for the Army Surgeon General. This CT and MRI mission is world wide.

4. June 1983-June 1989, Chief, Health Physics, Dwight D. Eisenhower Army Medical Center, Ft. Gordon, GA.

Duties: Served as Chief, Health Physics, and Radiation Protection Officer. Responsible for supervision and management of broad scope radiation protection program including management of US Nuclear Regulatory Byproduct Materials License No. 10-12044-03 and Department of Army Radioactive Materials Authorization No. 10-07-81. Served as Regional Consultant to DOD Health Region 10, which includes 9 Army Community Hospitals, and clinics in Panama and Puerto Rico. Performs Technical Surveys of radioactive materials and radiation producing devices to evaluate health hazards and performs medical physics evaluations to optimize imaging. Provides education support to professional staff. Supervises the personnel dosimetry program and performs dosimetry analysis of both radiation workers and patients. Provide mammographic surveys throughout the Region in support of ACR Accreditation. Is the Medical Physics Consultant on acquisition and acceptance testing of Computerized Tomography (CT) Systems and Magnetic Resonance Imaging (MRI) Systems for the Army Surgeon General. This CT and MRI mission is world wide.

5. September 1976 - June 1980, Chief, X-Ray Branch, Academy of Health Sciences, Ft. Sam Houston, TX.

Duties: Programs, plans and supervises overall operation of branch, including performance of 36 instructors and about 430 students annually. Branch is responsible for teaching the x-ray technologist program (radiographic) for the US Army. Also coordinates, plans, and supervises clinical training. Serves as Chairman of X-Ray Specialist Curriculum Committee, and Chairman of Medicine and Surgery Division Physics and Biophysics Committee. Serves as subject matter expert in radiology for Combat Development and Health Care Systems.

6. January 1975 - July 1975, Chief, Health Physics Branch, US Army Environmental Hygiene Agency Regional Activity South, Ft. Sam Houston, TX.

Duties: Conducts radiation protection surveys of US Army installations containing or generating ionizing radiation. Geographical area of support is all states west of the Mississippi River. Also reviews NRC license and DA Authorization applications. Performs technical consultation on radiation safety hazards.

Curriculum Vitae William B. Johnson

7. March 1974 - December 1974, Chief, Department of Nuclear Medical Sciences, US Army Medical Laboratory, Ft. Sam Houston, TX.

Duties: Supervises laboratory procedures and techniques of radiation biology, radiochemistry, and biophysics for regional reference laboratory. Geographic area of support includes United States, Pacific Region, Korea, and Panama. Supervises radiation detection measurements, preparation and analysis of radioisotopes in support of diagnostic and other clinical procedures. Provides support on environmental surveillance. Advises on radiological hygiene matters to prevent unnecessary exposure of personnel to ionizing radiation. Performs duty of Chairman, Radioisotope Committee, and Radiological Protection Officer. Manages all aspects of AEC License No. 42-06316-01, and Department of Army Authorization for Radioactive Materials. Performs Health Physics surveys and overall monitoring of all Laboratory Departments engaged in work involving radioactive material.

8. January 1973 - February 1974, Survey Officer, Health Physics Division, US Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

Duties: Reviews AEC license and Department of Army Authorizations applications as well as drafts Army directives and technical publications pertaining to radiological health; evaluates proposed in-system items containing or generating ionizing radiation; makes on-site surveys of Army diagnostic, industrial, and therapeutic x-ray facilities, radioactive sources, accelerators, human use of radioisotopes and other sources of ionizing radiation; prepares reports with recommendations for corrective action; assists in training activities. Performs as Alternate Radiological Protection Officer. This requires preparation and maintenance of records and reports on receipt, issue, use, inventory, storage, and disposal of radioactive materials. Performs health physics surveys of all agency divisions engaged in working with radioactive materials.

9. September 1972 - October 1972, Health Physics Technician, SM1 Nuclear Power Plant, Ft. Belvoir, VA.

Duties: Conducts radiological surveys, performs treatment to maintain proper process fluid conditions of nuclear power plant. Operates nuclear power plant controls and equipment. Assists in refueling operations and preparing spent fuel elements and demineralizers for storage and shipment. Monitors process fluids for radioactivity and performs chemical separations. Conducts radiological surveys of nuclear power plant personnel, equipment, work areas and reactor elements.

Curriculum Vitae William B. Johnson

MEMBERSHIPS, PAPERS, PRESENTATIONS AND AWARDS:

Member, Health Physics Society (1973)

Member, Eta Chapter, Delta Omega Society (1977)

Member, The Association of Military Surgeons of the United States (1998)

Member, The Order of Military Medical Merit (1999)

"The Final Step in Decommissioning of the SM-1A Nuclear Power Plant: A Closeout Survey," AEHA Report No. 43-001-74, Health Physics National Meeting, 1974.

"A Data Base Management System For Real-Time Monitoring of Operating Parameters of A Diagnostic X-Ray System," Ph.D. Dissertation, University of North Carolina, Chapel Hill, NC, 1983.

"Computerized Quality Assurance in Diagnostic Radiology," Health Physics National Meeting, Baltimore, MD, 1983.

"Acceptance Testing of Computerized Tomography Systems," Savannah River Chapter Health Physics Society Meeting, September 1985.

"Operational Problems for a Radiation Protection Program at A Major Medical Institution," Medical Physics in Military Medicine Course, AEHA, MD, September 1987.

"A Protocol to Comply With The Joint Commission of Accreditation of Health Care Organizations Requirements in Diagnostic Radiology," Medical Physics In Military Medicine Course, USAEHA, MD, October 1988.

"Acceptance Testing of Computerized Tomography Systems Course," 24 hours, USAEHA, February 1993.

"Mammography Physics and Performance Testing," 4 hour mini-course, AMEDD Health Sciences Course, USACHPPM, October 1994.

"Mammography Accreditation/Certification and MQSA," 2 hour presentation, Basic Radiation Protection Officer's Course, USACHPPM, August 1996, April 1999.

"MQSA Final Regulations & Implications for Medical Physicist," 2 hour presentation, Preventive Medicine Health Force Protection Conference, Atlanta, GA, August 1999.

DEPARTMENT OF THE ARMY
HEADQUARTERS, WALTER REED ARMY MEDICAL CENTER
WASHINGTON, DC 20307-5001

WRAMC Regulation
No. 40-10

2 June 1999

Medical Services
HEALTH PHYSICS

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*This document supersedes WRAMC Regulation 40-10, dated 6 September 1996.

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Chapter 1 General

1-1. Purpose. The purpose of this regulation is to supplement applicable Federal, State and Army regulations governing the methods for control of potential health hazards resulting from the procurement, possession, storage, transportation, use and disposal of radioactive materials and equipment capable of producing potentially hazardous radiation.

1-2. Applicability. This regulation is applicable to all activities assigned or attached to Walter Reed Army Medical Center (WRAMC) for Health Physics support.

1-3. References. Required and related publications are listed in appendix A.

1-4. Definitions and Terms. The definitions, terms, and abbreviations that are used in this regulation are listed in the glossary.

1-5. ALARA

a. Management Commitment.

(1) The management of this medical facility is committed to the program described herein for keeping individual and collective doses as low as reasonable achievable (ALARA). In accordance with this commitment, we hereby describe an administrative organization for radiation safety and will develop the necessary written policy, procedures, and instructions to foster the ALARA concept within our institution. The organization will include a Radiation Control Committee (RCC) and a Radiation Protection Officer (RPO).

(2) We will perform a formal annual review of the radiation safety program, including ALARA considerations. This will include reviews of operating procedures and dose records, inspections, and consultations with the radiation safety staff or outside consultants.

(3) Modifications to operating and maintenance procedures and to equipment and facilities will be made if they will reduce exposures unless based upon an ALARA analysis is considered to be unjustified. We will be able to demonstrate, if necessary, that improvements have been made, that modifications have been considered, and that they have been implemented when reasonable. If modifications have

been recommended but not implemented, we will be prepared to describe the reasons for not implementing them.

(4) In addition to maintaining doses to individuals as far below the limits as is reasonable achievable, 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 doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

Stochastic Limit (TEDE) ¹	5 rem in 1 year
Nonstochastic Limit H _d and CEDE other than the eye	50 rem in 1 year
Shallow Dose Equivalent H _s Skin or Extremity	50 rem in 1 year
Lens of the Eye	15 rem in 1 year
Dose to Embryo or Fetus ²	0.5 rem in gestation period
Planned Special Exposures	Not Allowed Without Waiver
Emergency Exposure Limits (Life Saving)	100 rem
Emergency Exposure Limits (Not Life Saving)	10 rem

¹ Total Effective Dose Equivalent (TEDE) = External Exposure at a depth of 1 cm in tissue (H_d), and committed effective dose equivalent (CEDE) from internal exposure

² H_d to pregnant woman and dose to the embryo or fetus (after notifying the RPO in writing)

Members of the Public	0.1 rem in any one year
Occupationally Exposed Individuals ¹	0.5 rem in any one year
Occupationally Exposed Minors (Under 18 years of age)	10% of the annual dose limits for occupationally exposed adults

¹ Individuals who occasionally enter restricted areas must not receive a radiation exposure in excess of that permitted for any member of the public, however, transient operations may exist which require exposure of individuals not normally occupationally exposed to be exposed to levels in excess of 0.1 rem limit. Approval for this practice must be obtained in advance from OTSG and the NRC as per 10 CFR 20 for licensees.

Table 1-3 Investigation Levels		
(mrems per calendar quarter)	Level I	Level II
Whole Body ¹	125	375
Lens of the Eye	375	1,125
Other ²	1,250	3,750

¹ TEDE

² Other includes: Shallow-dose equivalent (H_s) to the skin or to any extremity, or the sum of the deep-dose equivalents (H_d) and the committed dose equivalents (H_T) to any individual organ or tissue other than the lens of the eye.

b. Radiation Control Committee.

(1) Review Proposed Users and Uses.

(a) The RCC will thoroughly review the qualifications of each applicant concerning the types and quantities of materials and methods of use for which application has been made to ensure that the applicant will be able to take appropriate measures to maintain exposure ALARA.

(b) When considering a new use of byproduct material, the RCC will review the efforts of the applicant to maintain exposure ALARA.

(c) The RCC will ensure that the users justify their procedures and that individual and collective doses will be ALARA.

(2) Delegation of Authority.

(d) The RCC will delegate authority to the RPO for enforcement of the ALARA concept.

(e) The RCC will support the RPO when it is necessary for the RPO to assert authority. If the RCC has overruled the RPO, it will record the basis for its action in the minutes of the quarterly meeting.

(3) Review of the ALARA Program.

(a) The RCC will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

(b) The RCC will perform a quarterly review of occupational radiation exposure with particular attention to instances in which the investigation levels in Table 1-3 are exceeded. The principal purpose of this review is to access trends in occupational exposure as an index of the ALARA program quality and to decide if action is warranted when investigation levels are exceeded (see

paragraph 1-5.f. below for a discussion of investigation levels).

(c) The RCC will evaluate our institution's overall efforts for maintaining doses ALARA on an annual basis. This review will include the efforts of the RPO, authorized users, and workers as well as those of management.

c. Radiation Protection Officer.

(1) Annual and Quarterly Review.

(a) Annual Review of the Radiation Safety Program. The RPO will perform an annual review of the radiation safety program for adherence to ALARA concepts. Reviews of specific methods of use may be conducted on a more frequent basis.

(b) Quarterly Review of Occupational Exposures. The RPO will review at least quarterly the external radiation doses of authorized users and workers to determine that their doses are ALARA in accordance with the provisions of Section 6 of this program and will prepare a summary report for the RCC.

(c) Quarterly Review of Records of Radiation Surveys. The RPO will ensure radiation surveys in unrestricted and restricted areas are reviewed to determine that dose rates and amounts of contamination were at ALARA levels during the previous quarter.

(2) Education Responsibilities for the ALARA Program.

(a) The RPO will schedule briefings and education sessions to inform workers of ALARA program efforts.

(b) The RPO will ensure that authorized users, workers, and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that management, the RCC, and the RPO are committed to implementing the ALARA program.

(3) Cooperative Efforts for Development of ALARA Procedures.

(a) Radiation workers will be given opportunities to participate in formulating the procedures that they will be required to follow.

(b) The RPO will be in close contact with all users and workers to develop ALARA procedures for working with radioactive materials.

(c) The RPO will establish procedures for receiving and evaluating suggestions of individual workers for improving health physics practices and will encourage the use of those procedures.

(4) Reviewing Instances of Deviation from Good ALARA Practices. The RPO will investigate all known instances of deviations from good ALARA practices and, if possible, will determine the causes. When the cause is known, the RPO will implement changes in the program to maintain doses ALARA.

d. Authorized Users.

(1) New Methods of Use Involving Potential Radiation Doses.

(a) The authorized user will consult with the RPO during the planning stage before new use of radioactive materials.

(b) The authorized user will review each planned use of radioactive materials to ensure that doses will be kept ALARA.

(2) Authorized User's Responsibility to Supervised Individuals.

(a) The authorized user will explain the ALARA concept and the need to maintain exposures to all supervised individuals.

(b) The authorized user will ensure that supervised individuals who are subject to occupational radiation exposure are trained and educated in good health physics practices and in maintaining exposures ALARA.

e. Individuals Who Receive Occupational Radiation Doses.

(1) Workers will be instructed in the ALARA program and its relationship to work procedures and work conditions.

(2) Workers will be instructed of recourses available if they feel that ALARA is not being promoted on the job.

f. Establishment of Investigation Levels in Order to Monitor Individual Occupational External Radiation Doses.

(1) This institution hereby establishes investigation levels for occupational external radiation doses that, when exceeded, will initiate review or investigation by the RCC and/or the RPO. The investigation levels that we have adopted are listed in Table 1-3. These levels apply to the exposure of individual workers.

(2) The RPO will review and record on the Automated Dosimetry Report (ADR) results of personnel monitoring not less than once in any calendar quarter. The following actions will be taken if the investigation levels as stated in Table 1-3 are exceeded.

(a) Personnel Dose is Less Than Investigation Level I. Except when deemed appropriate by the RPO, no further action will be taken in those cases where an individual's dose is less than Table 1-3 values for the Investigational Level I.

(b) Personnel Dose is Equal to or Greater Than Investigation Level I but Less Than Investigation Level II. The RPO will review the dose of each individual whose quarterly dose equals or exceeds Investigation Level I and will report the results of the reviews at the first RCC meeting following the quarter when the dose was recorded. If the dose does not equal or exceed Investigation Level II, no action related specifically to the exposure is required unless deemed appropriate by the Committee. The Committee will, however, review each such dose in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.

(c) Personnel Dose is Equal To or Greater Than Investigation Level II. The RPO will investigate in a timely manner the causes of all personnel doses equaling or exceeding Investigation Level II and, if warranted, will take action. A report of the investigation, any actions taken, and a copy of the individual's ADR will be presented to the RCC at its first meeting following completion of the investigation. The details of these reports will be included in the RCC minutes.

(d) Re-establishment of Investigation Levels to Above Those Listed in Table 1-3. In cases where a worker's or a group of workers' doses needs to

exceed an investigation level, a new, higher investigation level may be established for that individual or group on the basis that it is consistent with good ALARA practices. Justification for new investigation levels will be documented.

(e) The RCC will review the justification for and must approve or disapprove all revisions of investigation levels.

Chapter 2 Training

2-1. Purpose. The NRC requires training for any employee who works in or frequents the vicinity of any radiation area. The Commander, WRAMC, has implemented training programs pertaining to the hazards of radiation and the methods for minimizing those hazards for radiation workers and other personnel.

2-2. Training Programs

a. Initial Briefing.

(1) The Principal User is responsible for the safe use of Radioisotopes and is required to give initial and annual briefings to all personnel working in areas designated on their authorization. The briefings will cover as a minimum, the following:

(a) WRAMC Notice to Employees (Provides basic "Right to Know" information). The Health Physics personnel post notices in each laboratory or in a location accessible to all workers that use radioactive materials.

(b) NRC Form - 3, Notice to Employees.

(c) Title 10, Code of Federal Regulations, Parts 19 (Notices, Instructions, and Reports to Workers; Inspections), 20 (Standards for Protection Against Radiation), and 21 (Reporting of Defects and Noncompliance).

(d) Information concerning the storage, transfer, use and disposal of radioisotopes allowed under the authorization.

(e) Authorization to Use Radioisotopes, WRAMC Form 1661 (Application for Authorization to Use Radioactive Material - Human Use) and/or WRAMC Form 1662 (Application for Authorization to Use Radioactive Material-Nonhuman Use).

(f) Hazards and protective measures associated with isotope usage or exposure to other sources of radiation.

(g) Occupational Dose Records. Review the dosimetry report for the authorization and the means to keep exposures ALARA.

(h) Pregnancy Surveillance Program.

(2) All personnel will acknowledge receiving and understanding the above information by signing and dating WRAMC Form 538 (Radiation Worker Briefing).

b. Introductory Principles of Radiation Protection Course: This one day course, given by the staff of the HPO, is designed to provide the minimum initial training required to use radioactive material, and to reinforce the training provided by the Principal User. It provides supplementary training, in an academic setting, required for the safe handling of radioisotopes and protection of individuals from external and internal radiation hazards. All radiation workers must attend this course (presented at least twice a year), as soon as possible after beginning work at WRAMC. Failure to attend the course by a worker's second opportunity will result in consideration being given to suspending that worker's authorization to work with radioactive materials. An examination is given at the end of this course. If the student fails the exam it may be retaken after additional preparation. The student may also elect to retake the course.

c. Laser Safety Course: This fully accredited one day course, is designed as an instructional and practical laser safety course which is required for certification as a hospital laser user. All laser users shall attend this course (presented at least twice a year), as soon as possible after beginning work at WRAMC. Failure to attend the course by a worker's second opportunity will result in not being given laser privileges at WRAMC. This course is primarily designed for hospital laser users and is not required for WRAIR, NMRI and AFIP research laser users, however, it is strongly encouraged that they attend.

d. Principal User Classes. The senior staff of the HPO conducts periodic classes on selected topics. These topics are based on the need to disseminate current information on license and regulation changes, to correct deficiencies that have been noted and to enhance the professional competency of individuals working in radiation environments. This

is mandatory for Principal Users. Coworkers are encouraged to attend.

e. **Nursing In-service:** Annual radiation safety training for nursing staff who encounter patients undergoing therapy with radioisotopes. Specific details on the types of therapy or other procedures are covered.

f. **Support Personnel Briefing:** Presented annually to personnel whose duties occasionally take them into restricted areas. It will familiarize them with the signs, placards, and color-codes associated with radioactive material use. It also gives a general outline of radiation hazards and contamination procedures and reinforces the ALARA principle.

g. **Fire Fighters Briefing.** Presented annually and covers methods of designating where radioactive materials are used, use of radiation detection instruments, notification procedures and procedures for ensuring protection from contamination and internal deposition.

h. **Military Police and Security Personnel Briefing.** Discusses where radioactive material are used, notification procedures and procedures for ensuring protection from contamination and internal deposition.

i. **On-The-Job Training.** Supervisors will conduct on-the-job training of sufficient content and duration to ensure that all personnel under their supervision know how to safely perform their work. As a minimum, the immediate supervisor will:

(1) Explain the hazards associated with the job the employee is to perform, the corresponding safe practices to be followed, and the standing operating and emergency procedures for the operations.

(2) Explain the steps required to perform the job and the equipment to be used (including safety equipment).

(3) Where possible, demonstrate how the operations are performed and allow the employee to practice the steps and constructively critique the employee's performance.

(4) Periodically spot check the employee's safety practices.

Chapter 3

Authorization to Use Radioactive Material

3-1. General

a. **NRC Licenses.** The NRC has issued two Byproduct Material licenses to WRAMC allowing the use of specific types and quantities of byproduct radioactive material. In addition, the Department of the Army controls all non-byproduct radioactive material exempt from NRC specific license control or byproduct material used, stored or disposed of outside the United States, its territories or possessions.

b. The RCC issues Radioactive Material Authorizations to Principal Users as a means of controlling the use of radioactive material. All users of radioactive material must receive their authorization prior to receiving and using the material.

c. **Nonhuman Use Radioactive Material Authorizations** are issued for 3 years. **Human Use Authorizations** are issued for 1 year. Both types of authorizations may be renewed upon request.

d. Individuals possessing more than 225 grams of natural uranium compounds (such as uranyl acetate) are required to obtain an authorization.

e. Contractors or non-government agencies wishing to use radioactive sources on U.S. Army installations must obtain the appropriate Department of the Army Radiation Permit (DARP) or Department of the Army Radiation Authorization (DARA), or local Command approval in accordance with the guidelines in AR 385-11. The user will submit a written request to the HPO, and include at least the following information:

(1) Use and storage information and use location.

(2) Copy of the applicable license(s).

(3) Operating procedures.

(4) Radioactive source(s), element, atomic number, and activity.

(5) Estimated length of operation.

(6) A statement of understanding that the HPO will be notified before bringing radioactive materials on the installation.

(7) In the unlikely event that the sealed source leaks and contaminates Federal property, the contractor or agency will restore the property to Nuclear Regulatory Commission's unrestricted use criteria.

f. The NRC requirements stipulate that a Radiation Control Committee be established to exercise administrative control over the safe use of these radioactive materials. The WRAMC RCC has been chartered to meet these requirements.

3-2. Application Procedure

a. To obtain, amend, renew, or terminate an authorization for use of radioactive material, individuals must submit WRAMC Form 2046R (Application for Authorization to Use Radioactive Material-Human Use) 1 June 1996, WRAMC Form 1662 (Application for Authorization to Use Radioactive Material-Nonhuman Use) or a memorandum clearly indicating their authorization amendment request. Each Principal User and coworker must submit WRAMC Form 1643 (Training and Experience of Authorized Radioisotope Users) with the application. Each physician listed on a Human Use Authorization is required to submit NRC Form 313-M Supplement B (Preceptor Statement) or a certificate of board certification with the application. Protocols describing the use and accountability of radioactive material from the time of receipt until the time of disposal will be submitted with the application on WRAMC Form 1644 (Health Physics Radioactive Protocol). Applications will be submitted to the HPO for review and approval. All applications for human use of radioisotopes will be submitted to the Human Use Subcommittee of the RCC by the HPO for review of physician training and experience.

b. All requested information on the application must be provided. Incomplete applications will be returned, causing a delay in approval.

c. Application for use of gamma cell irradiators must include a copy of the proposed Standing Operating Procedures (SOP) addressing personnel safety, routine operation and emergency provisions.

3-3. Review Procedures. All applications will be reviewed by the RCC and HPO to ensure that;

individuals meet the training and experience requirements, proposed procedures do not violate existing regulations, and facilities and equipment are adequate for proposed usage. If human use or nonhuman use applications meet the approval of the appropriate subcommittee of the RCC, they will be signed by the Chairman of the Human Use Subcommittee and granted interim approval. All interim approvals will be reviewed by the next convening RCC for final approval.

3-4. Termination of Authorization. An authorization may be terminated by the Principal User, the RCC, or the HPO at any time. When an authorization is terminated, the Principal User will ensure that all work areas are cleared by the HPO prior to releasing them for alternate use and coordinate final disposition or transfer of all radionuclides with the Radioactive Materials Control Branch, HPO.

Chapter 4 General Rules for the Safe Use of Radioactive Material

4-1. Responsibilities

a. Principal Users of radioactive materials are responsible for applying precautions listed in this chapter and ensuring their implementation by personnel listed on their Radioactive Material Authorization.

b. Principal Users of radioactive materials are responsible for maintaining a current inventory of all radioactive material on DA FORM 3862 (Controlled Substances Stock Record) or on a computer format that records the equivalent information. A complete inventory will be conducted at least every quarter and the inventory records signed and dated by the Principal User. The Health Physics Office will conduct a 100 percent joint inventory of all authorizations at least every six months.

4-2. Laboratory Precautions. General rules for the safe use of radioactive materials include:

a. Wear laboratory coats or other removable protective clothing at all times when actively involved in the use of unsealed radioactive material. To preclude the possible spread of contamination, only wear the laboratory coats or other protective clothing in the designated work areas.

b. Wearing of disposable gloves is encouraged at all times using unsealed radioactive materials, however, gloves are not required when:

(1) Using quantities less than 1 percent of the 10 CFR 20 Appendix C values or 10 percent of the value in Table 7-1.

(2) When handling totally encapsulated sealed sources of beta or gamma types that are exempt from leak testing requirements (see paragraph 9-5.a.).

(3) During the injection of a radiopharmaceutical when the loss of tactile sensation would hinder venipuncture technique potentially resulting in infiltrations, thereby requiring repeat studies and increasing patient exposure.

c. Monitor hands, clothing, and work areas for contamination after each procedure and before leaving the controlled area.

d. Do not eat, drink, smoke, or apply cosmetics in any area where radioactive materials are used or stored.

e. Do not store food, drink, or personal effects in areas where radioactive materials are used or stored.

f. Always wear assigned personnel dosimetry while in radioactive materials use or storage areas. Whole body dosimeters should be worn at chest or waist level. Finger or extremity dosimeters should be worn close to and facing sources handled. When not being worn, store dosimeters in the approved low-background storage location.

g. Dispose of radioactive waste only in specially designated receptacles, labeled, and if necessary shielded receptacles

h. Never pipette by mouth.

i. Confine radioactive solutions in containers plainly identified and labeled with the name of the compound, radionuclide, date, activity, and radiation level, if applicable.

j. Transport radioactive materials in appropriately shielded containers.

k. When transporting radioactive materials and waste, use carts to avoid contact with the surface of the radioactive waste container. Do not set

radioactive waste containers down in uncontrolled areas.

4-3. Nuclear Medicine Precautions. Additional general rules specifically applicable to preparations and use of radioactive materials for human use include:

a. Individuals who prepare a radiopharmaceutical kit shall use a syringe radiation shield when administering a radiopharmaceutical by injection unless the use of the shield is contraindicated for that patient.

b. Assay each patient dose in the dose calibrator before administration. Do not administer any doses that differ from the prescribed dose by more than 10%. Check the patient's name, identification, and prescribed radionuclide, chemical form, and dosage before administering the radionuclide.

c. Wear a finger dosimeter during elution of the generator, preparation, assay, and injection of the radiopharmaceuticals.

d. Survey the generator, kit preparation and injection areas for contamination after each procedure or at the end of the day. Decontaminate when necessary.

4-4. Ventilation in Radiation Controlled Areas. Procedures potentially resulting in the generation of radioactive aerosols, dusts, or gaseous products will be conducted in a hood, iodine box, dry box or other suitable closed system.

a. Radioactive gases or materials with gaseous radioactive daughters will be stored in gas-tight containers and kept in areas having approved ventilation.

b. The average velocity for hoods or gloveboxes will be 100 fpm when handling low to moderate levels of volatile radioactive materials. For highly toxic or high-level volatile radioactive material, the velocity will be 125 to 150 fpm.

4-5. Determination of Major versus Minor Spills

a. A spill is considered major if there is an accidental or uncontrolled release of 1 mCi or more of any radionuclide.

b. The exception to this rule is Tc-99m and Tl-201 used in the Nuclear Medicine pharmacy where a spill is considered major if 100 mCi or more is released.

c. The decision to implement a major spill procedure instead of a minor spill procedure depends on several incident specific variables. Variables to consider include;

- (1) Number of individuals affected.
- (2) Other hazards present.
- (3) Likelihood of the spread of contamination.
- (4) Types of surfaces contaminated.
- (5) Radiotoxicity of the spilled material.

d. For some short-lived radionuclides, the best spill procedure may be restricted access to the area pending complete decay of the radionuclide.

4-6. Major Spills of Liquids and Solids

a. Clear the Area. Notify all persons not involved in the spill to vacate the room.

b. Prevent the spread of contamination by covering the spill with absorbent pads, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread of contamination.

c. Shield the source if possible. This should be done without further contamination or a significant increase in radiation exposure.

d. Notify the Health Physics Officer immediately.

e. Conduct limited decontamination by removing contaminated clothing and flushing contaminated skin with lukewarm water and then washing with mild soap. Do not use brushes or any other abrasive substances. Limit the spread of contamination by consolidating and keeping contaminated personnel in one location. Wait for Health Physics personnel to arrive and evaluate personnel before attempting further decontamination. Retain contaminated clothing and materials used in decontamination for further analysis by the Health Physics Office.

f. Initiate a radioactive spill report. A sample radioactive spill report is included in appendix B.

4-7. Minor Spills of Liquids and Solids

a. Notify persons in the area that a spill has occurred.

b. Prevent the spread of contamination by covering the spill with absorbent paper.

c. Clean up the spill wearing disposable gloves, remote handling tongs, and absorbent paper. Carefully fold the absorbent paper with clean side out and insert it into a plastic bag. Transfer the plastic bag to a radioactive waste container. Place other contaminated materials, such as disposable gloves, and any other contaminated disposable material into the plastic bag.

d. Survey the area with a low-range radiation detector survey meter. Check the area around the spill, hands, shoes, and clothing for contamination.

e. Report the incident to the Health Physics Officer.

f. Initiate a radioactive spill report. A sample radioactive spill report is included in appendix B.

Chapter 5 Personnel Monitoring

5-1. General

a. This chapter prescribes procedures and responsibilities for monitoring and recording occupational exposures to ionizing radiation from radiation producing devices and radioactive materials.

b. Each activity receiving personnel dosimetry service from the HPO will designate a personnel dosimetry coordinator and alternate to assist the HPO in the issue, exchange, and collection of dosimetry devices.

c. Appropriate personnel monitoring devices will be assigned to each individual as required by the Health Physics Office. In addition, other personnel monitoring techniques (i.e., whole body counting or bioassay) will be utilized to evaluate personnel dosimetry as deemed necessary by the Health Physics Officer.

d. Personnel monitoring devices will be assigned when individuals could potentially receive an

occupational exposure in excess of 10% of the levels in Tables 5-1 and 5-2 for occupational exposure in a calendar year.

Stochastic Limit (TEDE) ¹	5 rem in 1 year
Nonstochastic Limit H _d and CEDE other than eye	50 rem in 1 year
Shallow Dose Equivalent H _s Skin or Extremity	50 rem in 1 year
Lens of the Eye	15 rem in 1 year

¹ Total Effective Dose Equivalent (TEDE) = External Exposure at a depth of 1 cm in tissue (H_d), and committed effective dose equivalent (CEDE) from internal exposure

Members of the Public	0.1 rem in any one year
Dose to Embryo or Fetus ¹	0.5 rem in gestation period
Minors (Under 18 years of age)	10% of the annual dose limits for occupationally exposed adults

¹ H_d to pregnant woman and dose to the embryo or fetus (after notifying the RPO in writing)

e. Application for personnel dosimetry service must be completed by the individual and submitted on DD Form 1952 (Dosimeter Application and Record of Occupational Radiation Exposure) to the HPO. The HPO will evaluate the information on the application and issue appropriate dosimetry or provide written notification that dosimetry is not needed.

f. Assignment of a personnel dosimetry device to an individual does not automatically make one a radiation worker. Occasionally exposed individuals may be monitored to determine need for permanent issue of dosimetry devices.

g. The procedures and responsibilities for processing the application are:

(1) The applicant has the responsibility to furnish:

(a) Individual identification data.

(b) Previous occupational radiation exposure history.

(2) The supervisor has the responsibility to furnish:

(a) A statement of the type of exposures in the worker's environment (i.e., x-ray, neutron, or radioactive isotopes).

(b) Complete WRAMC Form 538 indicating that the applicant has been instructed concerning the safe handling and usage of the radioactive materials listed in the authorization permit.

(c) The responsibilities and rights of an occupational radiation worker.

5-2. Whole Body Dosimetry

a. The thermoluminescent dosimeter (TLD) badge is the primary dosimetry device used at WRAMC.

b. A whole body badge will be worn only by the individual to whom it is issued.

c. WRAMC issued dosimeters shall not be worn by any personnel when occupationally exposed at other facilities away from their designated Government job site. However, if an individual wears a different dosimeter while working at other facility, the individual will inform the authorization holder and the Health Physics Office of the off-duty (moonlighting) dose records no later than 2 months after such records are received by the individual or 4 months following termination of such moonlighting employment, whichever is earlier.

d. Whole body dosimetry will be worn:

(1) Below the shoulders.

(2) Above the hips.

(3) Outside the clothing.

(4) On the portion or area of the body nearest the radiation source.

(5) With the dosimeter window facing out (away) from the body, and towards the radiation source.

(6) In the event a protective garment such as a lead apron is worn while working with material specifically licensed by the NRC, the dosimeter shall be worn outside any shielding.

(7) For individuals wearing lead aprons or similar protective garments while practicing medical radiology, the whole-body dosimeter shall be worn inside of any protective garment.

(8) Personnel, such as those working with medical fluoroscopic or cardiac catheterization x-ray equipment, exposed to x-rays scattered from the patient will wear a collar dosimeter and a whole body dosimeter under the protective garment.

e. When not being worn, the personal monitoring devices will be stored in the designated location approved by the RPO.

f. The department dosimetry coordinator will ensure that the dosimeters are turned in to the activity dosimetry coordinator during the designated exchange periods.

g. Personnel not directly employed by WRAMC, such as independent contractors or temporary workers, shall be issued dosimetry at the discretion of the Health Physics Office.

5-3. Supplemental Monitoring Devices.

Additional personal monitoring devices will be provided when necessary to monitor a portion of the body or to obtain more immediate data. These devices will be worn only by individuals to whom they are issued.

5-4. Care of Monitoring Devices. When not being worn, personal monitoring devices will be stored in the place designated by the HPO and turned in to the Dosimetry Coordinator during designated exchange periods. Dosimetry devices are not to be worn during non-duty hours or when the individual is examined in medical or dental clinics.

5-5. Termination of Personal Dosimetry Service.

The Principal User will notify the Health Physics Office of the departure of any department personnel who are enrolled in the personal dosimetry program.

5-6. Bioassay

a. The HPO will designate individuals to participate in the bioassay program. Once so designated, individuals will participate until released, in writing, by the HPO.

b. Individual Responsibilities.

(1) Appear for the bioassay measurement at the time and place required.

(2) Provide appropriate samples for in-vitro counting.

(3) Inform the Health Physics Office of changes in working conditions or other factors that would influence the type or frequency of bioassay measurement.

5-7. Pregnancy Surveillance Program

a. 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.

b. The RPO must provide instructions regarding the prenatal exposure risks and concerns to the developing embryo or fetus. A copy of NRC Regulatory Guide 8.13 will be given to the declared pregnant radiation worker.

c. The written declaration shall be made on SF 600 (Health Record – Chronological Record of Medical Care) or locally approved form and placed in the woman's medical record.

d. Nursing mothers who are potentially exposed to the intake of radionuclides require special consideration to limit the dose to the child.

5-8. Records

a. Records of an individual's radiation exposure are provided to the Health Physics Office on an Automated Dosimetry Report (ADR) by the U.S. Army Ionizing Radiation Dosimetry Center. The ADRs are reviewed by the HPO, signed by the RPO, and stored in the HPO as part of an individual's medical record. Annual reports are forwarded to the Service Chiefs or Chiefs of the research groups for review and distribution to individuals.

b. The ADR is covered by the Privacy Act. Therefore, a written authorization, signed by the individual must be forwarded to the HPO before occupational exposure information can be released to third parties.

Chapter 6 Radiation Detection Instruments

6-1. General. The Health Physics Office will acquire, maintain and provide, to all activities, radiation detection instruments to meet the requirements of WRAMC's NRC licenses.

6-2. Calibration. The HPO will ensure that all instruments are calibrated and will maintain calibration records.

6-3. User Responsibilities. The User is responsible for:

- a. Security, proper use, and availability of assigned survey instruments.
- b. Performing proper operational and function checks prior to using the instrumentation. Notifying the HPO if an instrument is not functioning properly.
- c. Exchanging the survey instruments prior to the end of the calibration period

6-4. Survey Instrumentation

a. For high energy x-ray, beta, or gamma emitter, use a low-range thin-window G-M survey meter to survey all elution, preparation, and injection areas.

b. Perform a series of wipe tests to measure contamination levels in those areas using low energy beta emitters such as tritium or carbon-14. The method for analyzing wipe tests will be sufficiently sensitive to detect 100 dpm per 100 cm² for the contaminant involved.

c. Use a survey instrument capable of detecting dose rates as low as 0.1 mrem/hr for areas where radiopharmaceuticals are prepared for use or administered.

d. Keep a record of all survey results for three years, including negative results. The record will include:

- (1) Location, date, and type of equipment used.
- (2) Name of person conducting the survey (signature or initials).

(3) Type, serial number, and calibration date of the portable survey instruments.

(4) A drawing of the areas surveyed with contamination levels and dose rate action levels.

(5) Measured dose rates in mR/hr or contamination levels in dpm/100 cm², as appropriate.

6-5. Action Levels for Restricted Areas

a. The radioisotope user will clean or decontaminate the area for Action Level I where:

- (1) Contamination exceeds 1000 dpm/100 cm²;
- (2) The radiation level is two times the background, or 1 mrem/hr at 30 cm (1 foot) for x-ray or gamma radiation.

b. The radioisotope user will clean or decontaminate the area for Action Level II and contact the Health Physics Office immediately if:

- (1) Contamination exceeds 2000 dpm/100 cm²;
- (2) The radiation levels from x-ray or gamma radiation in an unrestricted area exceeds 2 mrem/hr at 30 cm (1 foot).

6-6. Action Levels for Unrestricted Areas. All unrestricted areas will be maintained at a removable contamination level of less than 200 dpm/100 cm².

6-7. Security of Radioactive Materials

a. The Principal User is responsible to ensure that:

- (1) Radioactive materials used within their authorization are properly secured.
- (2) Radiation hazards are properly posted.
- (3) The radioactive material is stored in a locked room, locked refrigerator, or locked container.
- (4) If the room is unlocked, and the radioactive material is not secured in a locked container, then someone must be in the room at all times.

b. If any radioactive material is believed to be missing, call the Health Physics Office **IMMEDIATELY** (within the same day that the

radioactive material is noticed missing). The Health Physics Office can then assist your laboratory in locating the radioactive material. In addition, if the quantity of material missing exceeds certain limits, the Health Physics Office may be required to notify the Nuclear Regulatory Commission within 24 hours upon discovery of the event.

Chapter 7 Radiation Protection Surveys

7-1. General. Periodic radiation protection surveys are required in all areas where radioactive materials are used or stored. Requirements and responsibilities for these surveys at WRAMC are contained in this chapter.

7-2. Responsibilities

a. The HPO is responsible for:

(1) Performing all pre-use surveys, weekly, monthly, quarterly, special and final surveys.

(2) Notifying the Principal Users of any deficiencies or radiological hazards noted during their surveys.

(3) Performing a resurvey within five (5) workdays of any areas where:

(a) Levels of removable contamination exceed Action Level II limits of 2000 dpm/100 cm², or 2 mrem/hr at 30 cm (1 foot) for x-ray or gamma radiation.

(b) Potentially hazardous situations are noted.

b. Principal Users are responsible to:

(1) Perform daily surveys as specified in 7-3.a.

(2) Notify the HPO immediately if levels of removable contamination exceed Action Level II limits of 2000 dpm/100 cm², or 2 mrem/hr at 30 cm (1 foot) for x-ray or gamma radiation.

(3) Notify the HPO immediately of any accidents or unusual incidents involving radioactive materials.

(4) Provide the HPO with corrective actions taken to rectify items of concern and noncompliance found during a radiation safety survey.

(5) Provide the HPO with a written request for any special surveys (i.e., pre-use, final, or equipment surveys).

(6) Ensure that a pre-use survey has been performed on all areas under their control prior to using or storing radioactive materials.

(7) Ensure that a final survey has been performed and approved in areas under their control prior to releasing the area for non-radioactive use, maintenance or modification.

(8) Request that a room be placed on administrative hold when there will be no use of radioactive material (RAM) for three or more consecutive months.

(9) Request that a room on administrative hold be reactivated at least 48 hours prior to intended use of RAM.

(10) Inform the HPO of any circumstances requiring special protective measures, i.e., chemical or biological hazards, while conducting radiation protection surveys.

7-3. Survey Requirements

a. Daily. Daily surveys are required for all areas where radionuclides are used in quantities greater than that listed in Table 7-1. Areas where gamma, x-ray, or high energy beta emitters are used will be surveyed using a low-range, thin-window G-M survey meter. Areas where low-energy beta emitters (such as H-3, C-14, S-35) are used will be surveyed for removable contamination using swipes or smears. The daily survey will be performed by the user at the end of each day of use. Survey results will be recorded, and will include: Date of survey; building; room surveyed; highest level of contamination found; MMCN or serial number of the survey meter; survey meter calibration due date; and the surveyor. The survey log will be kept in the room and will be readily available for review.

Table 7-1 10% of 10 CFR 20 Appendix C limits for Radionuclides Commonly Used at WRAMC	
The user must conduct contamination surveys if the following activities per protocol or procedure are exceeded. ¹	Activity (μCi)
³ H ¹⁴ C ⁴² K ⁵¹ Cr ⁶⁷ Ga ^{99m} Tc ²⁰¹ Tl	100
³³ P ³⁵ S ⁴⁵ Ca ⁵⁴ Mn ⁵⁷ Co ⁸⁵ Sr ⁸⁶ Rb ⁹⁹ Mo ^{95m} Nb ¹⁰³ Ru ¹¹¹ In ¹²³ I ¹²⁵ Sb ¹⁴¹ Ce ¹⁵³ Sm	10
²² Na ³² P ³⁶ Cl ⁴⁶ Sc ⁵⁹ Fe ⁸⁹ Sr	1
¹⁰⁹ Cd ¹²⁵ I ¹³¹ I	0.1

¹ For any radionuclide not listed, contact the HPO for the appropriate activity limit

b. No daily survey by the user is required if the activity of the isotopes used during the day is less than the activity shown in Table 7-1; however, it is always good practice to survey the work areas for contamination after using radioactive materials.

c. Weekly surveys by the Health Physics Office will be conducted if the activity of the unsealed radioactive material exceeds 200 μCi.

d. Monthly surveys by the Health Physics Office will be conducted if the activity of the unsealed radioactive material is less than 200 μCi and greater than the value in Table 7-1.

e. A quarterly radiation protection survey will be performed by the HPO staff in unrestricted areas where the HPO believes that an individual member of the public may receive an exposure to ionizing radiation. Quarterly surveys will be performed in areas where quantities do not exceed the values in Table 7-1.

f. Pre-use Survey. A pre-use survey will be performed by the HPO staff in all areas where radioactive materials will be used or stored to ensure the area meets Health Physics criteria.

g. Final Survey. A final radiation protection survey will be performed by the HPO staff in all areas (and on equipment) where radioactive materials have been used or stored prior to:

(1) Releasing the room or equipment for non-radioactive use.

(2) Releasing the room or equipment for maintenance.

(3) Moving the equipment from that location. No action may be taken until survey results are cleared by HPO.

h. Special Surveys. Special radiation protection surveys may be performed by the HPO staff at the discretion of the Health Physics Officer. Additionally, the Chief, Health Physics Office can require Principal Users to perform more frequent surveys in the event of excess contamination or noncompliance with safety procedures.

Chapter 8 Radioactive Waste Management and Control

8-1. Responsibilities

a. The HPO is responsible for ensuring that all radioactive waste is managed, controlled, and disposed of according to the directives and guidelines of applicable Army, Federal, and State regulations.

b. Principal Users of radioactive materials at WRAMC are responsible for the collection and handling of radioactive waste in accordance with guidelines in paragraph 8-4., and any special instructions issued as a condition of their WRAMC Radioactive Material Authorizations.

c. The Occupational Health Section will evaluate on a routine basis, the efficiency of ventilation hoods used for temporary storage of radioactive waste.

8-2. Policy. Radioactive waste from Walter Reed Army Medical Center and tenant activities will be controlled, packaged, transported, and disposed of in accordance with AR 385-11, Ionizing Radiation Protection; Title 10, Code of Federal Regulations; Title 49, Code of Federal Regulations; Nuclear Regulatory Commission Licenses issued to WRAMC; applicable provisions of State Government requirements for waste disposal sites located within their jurisdictions; and the guidelines delineated herein.

8-3. General. The below listed rules for the safe handling of radioactive materials should be followed:

- a. Wear laboratory coats or other protective clothing at all times in areas where radioactive materials are used.
- b. Wear disposable impermeable gloves at all times while handling radioactive materials.
- c. Monitor hands and clothing for contamination after each procedure or before leaving area.
- d. Do not eat, drink, smoke or apply cosmetics in any area where radioactive material is used or stored.
- e. Wear assigned personnel monitoring device(s) at all times while in areas where radioactive materials are used or stored. Whole body monitoring device(s) should be worn at chest or waist level.
- f. Dispose of radioactive waste only in specially designated receptacles.
- g. Confine radioactive solutions to covered containers, plainly identified and labeled with name of compound, radionuclide, date, activity, and radiation level, if applicable.
- h. Always transport radioactive materials in appropriately shielded containers.
- i. Wash hands after working with radioactive materials.

8-4. Radioactive Waste Control in the Laboratory or Clinic

- a. Principal Users are responsible for ensuring that radioactive waste is controlled in a manner that meets the safety and security measures prescribed by U.S. Army, Federal, and applicable State Regulations.
- b. All Users of radioactive materials are responsible for segregating their radioactive waste into the categories listed below:
 - (1) Solid. Short half-life, 65 days or less plus the following radionuclides; sulfur-35 (87.44 d), cobalt-58 (70.8 d), iridium-192 (74.02 d), and scandium-46 (83.8 d).
 - (2) Solid. Long half-life, greater than 65 days except for the following radionuclides; sulfur-35 (87.44 d), cobalt-58 (70.8 d), iridium-192 (74.02 d), and scandium-46 (83.8 d).

- (3) Lead. Shielding materials and pigs.
 - (4) Scintillation Vials. Biodegradable (Bio-safe, etc.) scintillation fluid.
 - (5) Scintillation Vials. Organic/non-biodegradable scintillation fluid.
 - (6) Aqueous Liquids. Readily soluble (or readily dispersible biological material) in water and neutralized to pH > 2 and pH < 12.
 - (7) Organic Liquids. With MSDS and approved Waste Profile Sheet for each chemical.
 - (8) Animal Carcasses/Excreta/Bedding. Short half-life.
 - (9) Animal Carcasses/Animal Waste. Long half-life.
 - (10) Animal Carcasses. < 0.05 μ Ci H-3 or C-14 per gram of animal tissue averaged over the entire weight of the animal.
 - (11) Gas. Contact the Health Physics Office.
 - (12) Sharps. See paragraph 8-5.d.
 - (13) Stock Source Vials. See paragraph 8-9.
- c. Limit the non-radioactive waste that is intermixed with radioactive waste to an absolute minimum.

d. Remove or obliterate all "Radioactive Material" labels on non-radioactive vendor shipping packages and on short half-life radioactive waste. Uncontaminated vendor shipping containers may be disposed of in the normal trash by the users. Short half-life waste will be delivered to Health Physics Office (HPO) collection points for subsequent storage, decay, and ultimate disposal in the normal trash when HPO personnel have determined that the waste has reached natural background radiation levels.

e. Store used Mo-99/Tc-99m generators and other equipment containing radioactive material in designated areas only. The radiation labels will be removed on such items only when they have reached levels indistinguishable from background and have been cleared by the HPO.

f. Maintain on-hand inventories of radioactive waste to a practical minimum.

g. Control radioactive waste in work areas to prevent unauthorized disposal by the custodial service. Properly labeled waste containers will be used for radioactive waste. Labeled radioactive waste containers will not be used for other purposes.

h. Ensure that all radioactive waste is delivered to HPO collection point personnel for ultimate disposal.

i. Mark all radioactive waste containers (receptacles) with the radiation caution symbol and the words "Caution - Radioactive Waste" or "Caution - Radioactive Material" and "DO NOT EMPTY!".

j. Ensure that radioactive material is not released into the sanitary sewage system without the specific approval of HPO.

k. Ensure that decontamination of reusable equipment is performed in laboratory sinks that have been authorized for that purpose. See paragraph 8-6. for specific requirements concerning this procedure.

l. Radioactive waste that is infectious waste must be properly disinfected before it is given to the HPO for disposal. **INFECTIOUS WASTE WILL NOT BE GIVEN TO HPO.**

8-5. Packaging Radioactive Waste for Disposal

a. Solid radioactive waste will be placed in plastic bags or a container lined with plastic bags. Only clear bags at least 4 mils thick will be used. Clear bags will allow visual inspection of the waste by HPO personnel at the time of turnin. Bags will be taped closed and tagged with a radiation tag containing the authorization number, radioisotope(s), and activity.

b. Bulk liquid waste retained for disposal shall be collected in plastic bottles or sealed in cans to diminish breakage. Liquid waste that will chemically react with plastic should be placed in glass bottles. The containers will be tagged as stated in paragraph 8-5.a.

c. Scintillation vials will be packaged separately from other materials. They will be tightly closed and placed in a shipping tray that is labeled with the words "Caution - Radioactive Material." Care must be taken to prevent breakage of the vials while in

storage or transport. The trays will be tagged as stated in paragraph 8-5.a.

d. All "Sharps" to include syringes with needles, needles and similar items must be separated from other radioactive waste, packaged in cardboard boxes or sharps containers and sealed to prevent personal injury. The sharps containers and boxes will be tagged as stated in paragraph 8-5.a. All sharps containers with long half-life waste may contain only minimal, residual liquid.

e. Short half-life materials and items contaminated with short half-life materials will be separated from other materials. Radioactive warning labels must be obliterated on all vials and materials prior to placing the items in the plastic bags. The bags will be tagged identifying isotope(s), activity, and authorization number. Do not use "radiation tape" to seals these bags.

f. Biological wastes (animal carcasses/animal waste) will be prepared by the user in a manner that allows the waste to be readily packaged in alternating 10-inch layers of waste and packing materials. Prepared biological waste will be placed in 4 mil clear bags and tagged as previously indicated.

8-6. Release of Radioactive Material into the Sanitary Sewage System

a. Liquid radioactive waste will not be released into the sanitary sewage system unless prior approval has been included in the WRAMC Radioactive Material Authorization.

b. Other conditions for the disposal of liquid radioactive waste material (as a byproduct of washing laboratory glassware or equipment) into the sewage system are:

(1) The total quantity of material released by the user in any one month will not exceed 100 μCi . Assume emptied glassware retains one percent of the radioactivity originally contained within the glassware.

(2) The sink must be conspicuously posted with a sign bearing the Radioactive Caution Symbol and words, "Caution - Radioactive Material Wash Sink", and with a notice to the user that radioactive material discharged through the sink must be readily soluble or dispersible in water.

(3) A record of the identity and activity of radionuclides released will be maintained by the Principal User. This record will be reviewed by HPO for compliance with regulatory limits.

8-7. Collection, Local Transportation and Storage of Radioactive Waste

a. Properly packaged radioactive waste will be brought to centralized collection points in building 40, building 503, building 2, or other designated locations. Under the supervision of the HPO, waste will be placed in barrels or other designated containers. Waste that has not been properly separated and tagged will not be accepted.

b. Principal Users will ensure that packaged radioactive waste brought to the collection points is supervised until accepted by HPO to preclude the possibility of loss or theft.

c. All radioactive waste (except mixed waste which contains a percentage of EPA regulated material) will be transported from the above noted collection points to the Radioactive Material Storage Areas located in Building 516, Forest Glen Section, WRAMC, for ultimate disposal.

d. Building 516, may be used to store all categories of radioactive waste.

e. Storage areas are considered "Restricted Areas" and will remain locked to preclude the possibility of loss or theft and protect individuals from exposure to radiation or radioactive materials.

f. Radioactive Material Storage Areas will be posted by Health Physics personnel with the appropriate warning signs prescribed by Title 10 CFR 20.1902.

g. Wastes will be packaged for ultimate shipment and disposal in accordance with the instructions furnished by the waste disposal contractor. The waste disposal contractor is determined by DOD Executive Agency for Low-Level Radioactive Waste, ATTN: AMSIO-DMW, Rock Island, IL 61299 in accordance with AR 385-11.

8-8. Radioactive Waste Disposal Supplies

a. Items of supply used for radioactive waste packaging are stocked by the Supply and Administration Branch, Material Division, Directorate of Logistics, WRAMC. All stockage

items meet Federal radioactive material packaging requirements for most types of the radioactive waste resulting from laboratory and/or clinical procedures at WRAMC.

b. Personnel involved with packaging of hazardous chemical radioactive waste will consult the HPO to ensure that the stockage items meet packaging requirements.

c. Principal Users are responsible for funding for materials and supplies used to dispose of radioactive waste. The HPO will order supplies needed to collect and package the waste received at collection points and will cite Clinical Investigation, Department of Pathology/Laboratory Services, Department of Radiology, AFIP, or WRAIR as appropriate. All supply orders submitted by HPO will be prorated to the using services.

8-9. Disposal of Stock Source Vials

a. All original stock source vials, whether depleted, decayed, or partially used will be turned over to the Health Physics personnel along with the radiation waste.

b. A stock source vial is defined as having an initial activity of at least 50 μCi of any radionuclide.

c. Original stock source vials, whether depleted or not, which are turned in as waste shall be kept separate from other waste.

d. When source vials are turned in to Health Physics, please provide the source HPO identification number (Yellow Tag Number).

e. If there are multiple vials listed under the same identification number, list the vials still in your possession.

f. The inventory log will be adjusted to show the change in the authorization inventory. Health Physics personnel will sign the inventory log if provided at the time of turn-in. In addition, Health Physics personnel will provide a signed receipt for possession of the source vial(s).

Chapter 9

Sealed Source Leak Testing and Accountability

9-1. Responsibilities

a. The HPO is responsible for ensuring and documenting that all sealed sources are acquired, inventoried, leak tested, transferred and disposed of in accordance with applicable requirements.

b. Principal Users are responsible for ensuring and documenting that all sealed sources used to support their operation are specifically permitted by their WRAMC Radioactive Material Authorization and that each source is acquired, inventoried, transferred and disposed of in accordance with the requirements of this chapter.

9-2. Acquisition of Sealed Sources. Regardless of activity or intended use, the acquisition of each sealed source will be cleared with the HPO prior to any commitment for purchase or receipt. The HPO will determine which Federal regulatory requirements apply to acquisition of the sealed source and provide prospective suppliers with any required certification/NRC license documents.

9-3. Inventory of Sealed Sources. A current inventory of all sealed sources will be maintained by the HPO.

a. Each accountable sealed source at WRAMC will be assigned a Health Physics control number by the HPO.

b. Each nonexempt sealed source will be inventoried quarterly and a record maintained by the HPO.

c. The Principle Users shall notify the HPO of any change in location of sealed sources under their control.

9-4. Transfer and Disposal of Sealed Sources. The transfer and disposal of all sealed sources will be coordinated with the HPO.

a. Individual sealed sources will be transferred only to authorized recipients or licensed disposal sites.

b. When items of equipment containing sealed sources are to be transferred or disposed of, the HPO will be notified. After performing a final survey to determine that all sealed sources have been removed, all radioactive warning labels have been obliterated, and the item is free of radioactive contamination, the HPO will provide written certification that the item

does not present a radiation hazard and may be disposed of through normal channels.

9-5. Leak Testing of Sealed Sources

a. Leak Test Requirements.

(1) Each sealed source with a half-life greater than thirty days and in any form other than gas will be tested for contamination or leakage by the vendor or the HPO before use.

(2) Sealed sources designed to emit alpha particles will be leak tested at intervals not to exceed three months. All other sealed sources containing by product material will be leak tested at intervals not to exceed six months. These leak tests will be performed by the HPO.

(3) Sealed sources that contain 100 microcuries or less of beta or gamma emitting material or 10 microcuries or less of alpha emitting material are exempt from such leak tests.

(4) Sealed sources containing only byproduct material with a half-life of less than thirty days or byproduct material as a gas is also exempt from leak tests.

(5) Sealed sources are exempt from six-month periodic testing if they are stored and not being used; however, these sources will be leak tested prior to any use or transfer if testing has not been done within the past six months.

(6) If there is reason to suspect a sealed source has been damaged it will be tested for leakage before further use.

b. Any sealed source with a positive leak test (greater than 0.005 microcuries) will be immediately withdrawn from use by the HPO. The HPO will retest to determine whether or not the source is leaking. If it is leaking, it will be resealed or disposed of in accordance with existing regulations.

c. WRAMC Form 1685 (Sealed Source Inventory and Leak Test Record), or its equivalent, will be used by the HPO to record leak test results. Consecutive entries will be made for each test including: The date, activity detected in microcuries, and the initials of the person performing the test.

Chapter 10
Health Physics Aspects of Patient Care

10-1. General Requirements

a. It is the responsibility of all personnel who are occupationally exposed to radiation from patients receiving radiotherapy to:

(1) Properly utilize the dosimetry issued to them.

(2) Know and conform to the radiation protection and emergency measures pertaining to their procedures.

b. Radiation safety procedures will not impede emergency medical care, however, a maximum effort will be made to minimize the exposure of individuals performing the treatment.

10-2. Responsibilities

a. The physician performing the therapy procedure will:

(1) Notify the HPO one week prior to the scheduled procedure date (emergency procedures as early as possible) and provide the following information:

(a) Patient's name.

(b) The date and time the procedure will be initiated.

(c) Type and approximate length of the procedure.

(d) Isotope activity.

(e) The location (treatment room, operating room, or ward room) where the radioactive material will be administered to the patient.

(f) The room and ward to which the patient will be assigned for the duration of the procedure.

(2) Ensure that there is a sufficient availability of personnel (i.e., nursing, health physics) and equipment to support the therapy.

(3) Ensure that the patient is not released without proper HPO clearance.

b. The service performing the procedure, Radiation Therapy, Radiation Oncology, or Nuclear Medicine will ensure that the physician performing the procedure is listed on the appropriate Human Use Authorization which covers the procedure and has been authorized by the RCC.

c. The HPO will:

(1) Establish radiation protection and emergency procedures for each type of therapy.

(2) Brief all personnel (especially the nursing staff) on the radiation protection and emergency procedures associated with that therapy.

(3) Determine, based on the information provided by the physician:

(a) The personnel dosimetry requirements.

(b) The radiation shielding required for the procedure.

(c) When HPO coverage will be required.

(d) Any special radiation protection and emergency procedures required.

(4) Brief the patient on Health Physics aspects of the procedure.

(5) Ensure that the appropriate dosimetry has been issued and is being utilized correctly.

(6) Prepare the room where the radioactive material will be introduced into the patient and where the patient will be located during the procedure to minimize and/or prevent the spread of contamination.

(7) Monitor the dosing of the patient to ensure that the radiation protection procedures are followed.

(8) Post the appropriate forms, signs and labels.

(9) Make periodic visits to the ward throughout the duration of the procedure. The frequency of the visits will be determined by the HPO.

(10) Ensure that all radioactive materials removed from the ward are either returned to storage or disposed of in the appropriate container.

(11) Determine, based upon measurements and regulatory requirements, when the patient will be

released from the restrictions required for radiation protection.

(12) Remove all forms, signs and labels at the end of the procedure.

(13) Release the room for general use at the earliest possible time consistent with radiation protection considerations with the exception of dedicated rooms.

d. The nursing staff and ward personnel will:

(1) Comply with radiation protection procedures.

(2) Notify the Health Physics Technician on call for the therapy and the Radiation Oncologist or Nuclear Medicine Physician in the event of patient emergencies, death, or unusual situations as outlined in radiation protection briefings.

e. Chief, Endocrinology Service. Ensure proper notification of nuclear medicine, Kyle Metabolic Unit, and HPO of scheduled ablation therapies to ensure proper and timely preparation.

10-3. Emergency Notification. In the event of an emergency or misadministration, notify the Health Physics Office at (202) 356-0058.

Chapter 11 Animals Containing Radioactive Material

11-1. Responsibilities

a. The Principal User is responsible to:

(1) Ensure that animals containing radioactive materials are housed only in cages labeled as containing radioactive material. The labels on the cages will indicate the radioisotope, millicurie amount, and date the radioisotope was introduced into each animal.

(2) Ensure that the cages containing radioactive animals are housed only in rooms that have been approved and posted by the HPO.

(3) Ensure the HPO and the Director of Department of Laboratory Animals, Walter Reed Army Institute of Research (WRAIR), are notified prior to the commencement or change in procedure of

all projects where radioactive materials are introduced into laboratory animals.

(4) Notify the HPO and the Director of Department of Laboratory Animals, WRAIR, at the termination of studies. Rooms or cages must be cleared and unposted by the HPO prior to release for unrestricted use.

(5) Remove all radioactive materials from rooms used exclusively to house animals.

(6) Ensure that all applicable radiation protection procedures are met.

(7) Notify the HPO of any unusual occurrences or incidents in which radioactive material is involved.

b. The HPO is responsible to:

(1) Ensure that rooms and cages used to perform procedures and house animals are properly posted and labeled.

(2) Inform the Principal User and the animal handlers of any special radiation protection procedures to be observed.

Chapter 12 X-Ray Producing Devices

12-1. Requirements

a. An initial design review or survey of the facility will be made including protective barriers, interlocks, and other associated protective devices of newly procured equipment.

b. An initial radiation protection survey will be performed prior to the routine use of any newly installed, modified, or relocated equipment.

c. All x-ray producing devices intended for human-use will have a radiation survey at least annually by the HPO.

d. All x-ray producing devices not intended for human-use will have a radiation survey at least triennially by the HPO.

e. A resurvey will be performed after every change in equipment, subsystem, component, workload, or operating conditions that might

significantly increase the exposure of patients or operating personnel to ionizing radiation.

12-2. Responsibilities

a. The using organization is responsible to:

(1) Ensure that a shielding evaluation is performed prior to the procurement, installation, modification, or relocation of any x-ray producing equipment or facility.

(2) Ensure that a radiation protection survey is performed after acceptance testing and prior to the use of any newly installed, modified, or relocated, x-ray producing equipment or facility.

(3) Notify the HPO of any change in equipment, subsystem, component, workload, or operating conditions.

(4) Report the location of all x-ray producing devices to the HPO.

(5) Collect portable x-ray equipment and make them available in a central location for surveying.

(6) Ensure that written procedures are established to provide radiation protection and emergency procedures for each facility.

(7) Keep exposures of patients or operating personnel to ionizing radiation as low as reasonable achievable.

(8) Ensure that only fully qualified personnel operate the equipment.

(9) If requested, provide an operator for the system during the radiation protection survey.

(10) Maintain a Quality Assurance program.

(11) Notify the HPO of any pregnant patients receiving medical radiation exposure.

(12) Conduct safety defect testing of lead aprons, thyroid collars, lead drapes, and gonadal shields at least annually.

b. Biomedical Electronics, Maintenance Division is responsible to:

(1) Provide written notification to the HPO of all corrections of deficiencies noted on survey reports.

(2) Notify the HPO of any changes in equipment, subsystem, component, or operating conditions.

(3) Provide a semiannual listing to the HPO of all x-ray equipment maintained, serviced, or vendor supported.

c. The HPO is responsible to:

(1) Maintain a registry of all x-ray producing devices within the Walter Reed Army Health Care System.

(2) Perform all radiation protection and compliance surveys, resurveys, and initial radiation protection analyses.

(3) Ensure that only qualified personnel perform radiation protection and compliance surveys.

(4) Conduct fetal dose estimates for pregnant patients receiving medical irradiation.

(5) Calculate and provide patient entrance skin exposures for x-ray systems.

(6) Perform an initial design review or survey of the facility including protective barriers, interlocks, and other associated protective devices of newly procured equipment.

Chapter 13

Non-Ionizing Radiation Sources

13-1. Purpose. This chapter outlines the non-ionizing radiation safety program for WRAMC and its tenant facilities. The responsibility for implementing and enforcing the non-ionizing radiation safety program rests with the Chief, HPO, WRAMC. To be successful, however, the program must be carried out as a joint venture with the Occupational Health Clinic and the Industrial Hygiene Section of the WRAMC Preventive Medicine Service, the WRAMC Safety Office, as well as the departments and activities that use non-ionizing radiation sources.

13-2. Applicability. The table located at the end of this chapter lists the individual program elements in

the WRAMC non-ionizing radiation protection program and indicates which elements are required for the various types of non-ionizing sources based upon their relative hazards.

13-3. Responsibilities

a. The Chief, HPO, WRAMC:

(1) Review requests for the procurement of equipment which uses or produces microwave or radio frequency radiation, laser radiation, ultrasound, and other high intensity optical radiation, hereafter collectively referred to as non-ionizing radiation.

(2) Maintain an inventory of non-ionizing radiation sources. Submit a copy of the inventory to the Industrial Hygiene Section for inclusion in the Health Hazards Information Module (HHIM) data base. Update the data base as necessary. Coordinate with the Occupational Health Clinic to ensure proper use of the inventory in the Occupational Vision Program.

(3) Ensure that users of non-ionizing radiation equipment and maintenance personnel develop Standing Operating Procedures (SOP). Ensure that users post these SOPs at visible locations in the user/maintenance facilities and that they strictly enforce SOP provisions. Maintain copies of SOPs and ensure users update them as necessary.

(4) Ensure users provide or contract for initial non-ionizing radiation safety training for all users and maintenance personnel.

(5) Coordinate with the U.S. Army Center for Health Promotion and Preventive Medicine for non-ionizing radiation safety surveys.

(6) Notify the Radiological Hygiene Consultants to MEDCOM and to the Office of the Surgeon General within 24 hours of any incident involving non-ionizing radiation sources.

b. Chief, Occupational Health Clinic will routinely review the HHIM database and coordinate with the HPO, and the Industrial Hygiene Section to screen individuals working with non-ionizing radiation for inclusion in the Occupational Vision Program.

c. Chief, Industrial Hygiene Section will coordinate with the HPO to enter non-ionizing

radiation source inventories into the HHIM data base and notify the Occupational Health Clinic of these sources.

d. Department heads and activity chiefs who are responsible for the operation of non-ionizing radiation equipment will:

(1) Provide the HPO with the type, model, serial number, maintenance management control number, and location of their non-ionizing radiation equipment.

(2) Receive HPO's review and approval prior to procuring new non-ionizing radiation equipment or modifying existing equipment.

(3) Notify the HPO prior to the relocation or disposal of non-ionizing radiation equipment.

(4) Develop SOPs for the safe use of non-ionizing radiation equipment and submit copies to the HPO. Ensure that they post SOPs at visible locations and strictly enforce SOP provisions.

(5) Coordinate with the HPO to develop a training program for non-ionizing radiation safety. Ensure that all users in the department or activity receive annual training and provide the HPO with training documentation.

(6) Ensure proper maintenance and calibration of non-ionizing radiation sources as required by the manufacturer.

(7) Ensure individuals selected for inclusion in the Occupational Vision Program receive appropriate testing at the Occupational Health Clinic.

(8) Notify the HPO immediately following an incident or suspected incident involving non-ionizing radiation sources to include proper documentation of all background information.

e. Supervisors of personnel responsible for the maintenance of non-ionizing radiation equipment will:

(1) Develop SOPs outlining radiation safety procedures used during the maintenance of non-ionizing radiation equipment and provide copies of the SOPs to the HPO.

(2) Ensure that all maintenance personnel working with non-ionizing radiation sources receive initial safety training and provide training records to the HPO.

(3) Notify department/activity chiefs of suspected incidents involving non-ionizing radiation sources.

(2) Characteristic X-rays: From the interaction of either electrons or ions on matter.

(3) Prompt gamma radiation: From the interaction of either ions or neutrons on matter.

(4) Neutron radiation: From the interaction of either electrons, photons, or ions on matter.

(5) Delayed radiations (beta and gamma rays): From induced radioactivity. There may be several sources of radiation throughout an accelerator, depending on its design and operating condition. Of particular importance at higher particle energies is the significant amount of induced radioactivity.

**Table 13-1
Non-Ionizing Radiation Protection Program Requirements**

Program Element	Microwave Sources	Laser Sources	High Intensity Optical Sources	UV Sources
HPO Approval for Procurement	All except ovens	Class IIIb and IV	All	All
Source Inventory	All except ovens	Class IIIb and IV	All	All
Hazard Training	Power Density > PEL ¹	Class IIIb and IV	Intensity > MPE ²	Irradiance > TLV ³
Area Posting Requirement	Power Density > PEL	Class IIIb and IV	Intensity > MPE	Irradiance > TLV
Ocular Surveillance	All except ovens	Class IIIb and IV	All	All
SOPs	Power Density > PEL	Class IIIb and IV	Intensity > MPE	Irradiance > TLV
Protective Equipment	Not Applicable	Class IIIb and IV	Intensity > MPE	Irradiance > TLV
Facility Surveys	Power Density > PEL	Class IIIb and IV	Intensity > MPE	Irradiance > TLV
HPO Disposal Notification	All except ovens	Class IIIb and IV	All	All

¹ Permissible Exposure Limit.

² Maximum Permissible Exposure.

³ Threshold Limit Value.

b. Radiation Equipment and Safety Systems.

(1) Interlocks.

(a) Personnel entrances into any high-radiation area shall be provided with either a door or shielding equivalent to that of the surrounding walls.

(b) All personnel access barriers will be equipped with interlock switches that cause the production of radiation by the accelerator to stop if the access barrier is opened. Interlocks shall also be provided to protect personnel from electrical hazards such as high-voltage power supplies and linear-accelerator modulators. All interlocks shall be tested and inspected periodically to ensure that they are functioning as designed.

(c) Certain accelerators for radiotherapy can be alternatively used to deliver electron or x-rays to a patient. These shall be provided with a suitable interlock system to prevent inadvertent exposure of the patient to electrons when x-ray exposure is intended. The electron-beam current will be limited to values consistent with electron-beam therapy.

(d) Emergency switches to stop the production of radiation shall be placed conspicuously in high-radiation areas so that personnel within such areas can have ready access to them in the event they are inadvertently caught within the area. The emergency switches shall be part of the interlock system and conspicuously marked as to their function.

(e) Warning signs will be posted and radiation-warning lights shall be designed into the fail safe circuit so that if the light has burned out, no radiation will be produced. The warning signs and lights will

**Chapter 14
Particle Accelerators**

14-1. Purpose. This chapter outlines the radiation safety program for WRAMC and its tenant facilities for particle accelerators. All individuals associated with the operation of a therapeutic radiation machine shall be instructed in and shall comply with the provisions of the registrant's quality management program.

14-2. General

a. Sources and types of radiations from accelerators:

(1) X-rays (bremsstrahlung): Form the interaction of electrons on matter.

be inspected and tested periodically to ensure they are functioning as intended.

(f) Airborne radioactivity may be produced by x-rays from accelerators above 6 MeV, and by all neutron-producing accelerators. The air vented from areas in which airborne radioactivity is suspected shall be dispersed into the atmosphere in a manner to meet existing local, state, and federal regulations.

(g) Induced radioactivity of accelerator components such as cyclotron dee structures, collimating slits, magnet chambers, or beam dumps needs to be considered with respect to possibly limiting access to radioactivity areas until the radioactivity has reached safe levels. Induced radioactivity of accelerator components needs to be considered for safe handling, storage, and transportation or the affected components.

(h) No individual, other than the patient, shall be in the treatment room during treatment or during any irradiation for testing or calibration purposes.

14-3. Responsibilities

a. All physicians, physicists, dosimetrists, and therapists assigned to Radiation Oncology Division are classified as radiation workers.

b. The Radiation Oncology Physicist shall:

(1) Perform Quality Control measures in accordance with TB MED 521.

(2) Perform weekly chart review of every patient under treatment.

(3) Maintain calibration of instrumentation, and periodically evaluate equipment function.

(4) Ensure appropriate treatment unit safety and warm-up inspections are performed.

(5) Supervise physical aspects of treatment planning.

(6) Supervise and review the dosimetry plans for the patient.

(7) Assist the dosimetrist in all aspects of treatment planning. Check the accuracy of the treatment plans before any treatment is delivered.

(8) Equipment calibrations.

(a) Spot checks shall be performed during full calibrations and at intervals not exceeding a month thereafter. A memorandum indicating the checks conducted and date performed shall be provided to the Health Physics Office no later than 2 weeks after performing the survey.

(b) Computer codes shall be verified by phantom dose calculations and in comparison to other calculations before being employed in treatment planning.

(9) Physics.

(a) Weekly check the outputs of all treatment beams.

(b) An independent qualified physicist shall check the output of the clinic units within 30 days of the full calibration.

(10) Radiation Safety.

(a) Perform an area survey of the adjoining spaces.

(b) Ensure HPO is notified in the event of any incidents, accidents, recordable events, or misadministrations.

c. The Health Physics Office shall:

(1) Maintain the individual dosimetry records.

(2) Provide calibrated area monitors and survey meters.

d. The RCC shall approve authorized users.

14-4. Emergency Notification. In the event of an emergency or misadministration, notify the Health Physics Office at (202) 356-0058.

**Appendix A
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33. Title 10, Code of Federal Regulations, Part 34, Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations.
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Radioactive Spill Report

Contact the Health Physics Office immediately after any spill at (202) 356-0058/59

Authorization Number: _____ Date of the Report: _____

Building Number: _____ Room Number: _____ Location: _____

The spill date: _____ and the time of the spill: _____

Give a brief description of the accident:

Instrument used to check for decontamination: _____

Meter Model No.: _____ Serial No.: _____ Calibration Due Date: _____

Personnel Present	Personnel Contamination Results ¹
_____	_____
_____	_____
_____	_____

¹ On the back of this sheet, indicate any personnel decontamination, additional monitoring, or precautions taken

Survey the spill area to identify any hot spots and begin decontamination. Conduct a post-decontamination wipe test.

Radioisotopes present or suspected in the spill:

_____ mCi of _____ as _____

_____ mCi of _____ as _____

_____ mCi of _____ as _____

Give a brief description of the follow-up actions taken to prevent reoccurrence:

The person submitting the report: _____

PRINT NAME

SIGNATURE

GLOSSARY**Activity**

The rate of disintegration (transformation) or decay of radioactive material. The units of activity are curie (Ci) and becquerel (Bq). 1 Ci = 3.7×10^{10} disintegrations per second, and 1 Bq = disintegrations per second.

ADR

Automated Dosimetry Report.

Adult

An individual at least 18 years of age.

As Low As Reasonably Achievable (ALARA)

The taking of every reasonable effort to maintain exposures to radiation as far below prevailing dose limits as is practicable. These efforts must take into account —

- a. State of technology.
- b. Economics of improvements in relation to the state of the technology.
- c. Economics of improvements in relation to benefits to the public health and safety.
- d. Other societal and socioeconomic considerations in relation to use of nuclear energy and radioactive materials in the public interest.
- e. Sample of good ALARA practices may be found in the NRC Regulatory Guides 8.10, 8.18, and 10.8.

Authorization

A formal, Radiation Control Committee (RCC) approved document permitting named individuals to order, receive, store, possess, and use radioactive materials.

Bioassay

The determination of kinds, quantities, or concentrations, and in some cases, the locations or retention of radionuclides in the human body, whether by direct measurement (in vitro counting) or by indirect (in vivo) analysis of materials excreted or removed from the human body.

Byproduct Material

Such material includes the following:

a. Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material. Generally, byproduct material is any radioactive material inevitably produced as a byproduct from the neutron-induced fission process within nuclear reactors.

b. The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processing primarily for its source material content including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute "byproduct material" regulated by the NRC under 10 CFR.

Committed Dose Equivalent ($H_{T,50}$)

The dose equivalent that will be received from an intake of radioactive material to organs or tissues of reference (T) by an individual during the 50-year period following the intake.

Controlled Area

An area, outside of a restricted area but inside an installation boundary, access to which can be limited by the commander for any reason.

Co-worker

An individual listed on an authorization who possesses qualifications similar to the Principal User.

Deep-Dose Equivalent

This dose applies to external, whole-body exposure and is the dose equivalent at a tissue depth of 1 centimeter (cm) or 1000 mg/cm² below the outer skin surface.

Dose Equivalent

The product of the absorbed dose in tissue (D) and the quality factor (Q) at the location of interest where $HT = D * Q$. The units of dose equivalent are the rem and sievert (Sv). The dose equivalent in rem is equal to the absorbed dose in rads multiplied by the quality factor; 1 rem = 0.01 Sv. Its purpose is to have a single unit, regardless of the type of radiation, describing the radiation effect on man.

Exposure

Ionizing radiation may be either produced from machines (x-ray machines, accelerators, etc.) or

spontaneously emitted by radioactive material. An individual located near such machines or materials may be "exposed" to the ionizing radiation emitted; hence, sustain and exposure.

Gieger-Mueller (G-M) Counter

A gas-filled detector which operates with a very high electric field where a single ionization event can trigger an avalanche of ionizations. The G-M detector is very sensitive, but all pulses from the G-M tube are of the same amplitude regardless of the number of the original ion pairs or energy of the incident ionizing radiation. Therefore, the G-M detector functions only as a simple counter of ionization events.

Half-life

Time required for half the atoms in a radioactive substance to disintegrate to another nuclear form. Also called physical half-life, and each radionuclide has its own unique half-life. For the WRAMC NRC license conditions:

- a. **Short Half-life.** Radioactive material containing one or more radionuclides having a radiological half-life of 65 days or less plus the following radionuclides; sulfur-35 (87.44 d), cobalt-58 (70.8 d), iridium-192 (74.02 d), and scandium-46 (83.8 d).
- b. **Long Half-life.** Radioactive material containing one or more radionuclides having a radioactive half-life of more than 65 days except for the following radionuclides; sulfur-35 (87.44 d), cobalt-58 (70.8 d), iridium-192 (74.02 d), and scandium-46 (83.8 d).

HPO

Health Physics Office.

Misadministration

The administration of:

- a. A radiopharmaceutical dosage greater than 30 microcuries of either sodium iodide I-125 or I-131:
 - (1) Involving the wrong patient or human research subject, or wrong radiopharmaceutical; or
 - (2) When both the administered dosage differs from the prescribed dosage by more than 20 percent of the prescribed dosage and the difference between the administered dosage and prescribed dosage exceeds 30 microcuries.

b. A therapeutic radiopharmaceutical dosage, other than sodium I-125 or I-131:

- (1) Involving the wrong patient or human research subject, wrong radiopharmaceutical, or wrong route of administration; or
- (2) When the administered dosage differs from the prescribed dosage by more than 20 percent of the prescribed dosage.

c. A gamma stereotactic radiosurgery radiation dose:

- (1) Involving the wrong patient or human research subject, or wrong treatment site; or
- (2) When the calculated total administered dose differs from the total prescribed dose by more than 10 percent of the total prescribed dose.

d. A teletherapy radiation dose:

- (1) Involving the wrong patient or human research subject, wrong mode of treatment, or wrong treatment site;
- (2) When the treatment consists of three or fewer fractions and the calculated total administered dose differs from the total prescribed dose by more than 10 percent of the total prescribed dose;
- (3) When the calculated weekly administered dose exceeds the weekly prescribed dose by 30 percent or more of the weekly prescribed dose; or
- (4) When the calculated total administered dose differs from the total prescribed dose by more than 20 percent of the total prescribed dose.

e. A brachytherapy radiation dose:

- (1) Involving the wrong patient or human research subject, wrong radioisotope, or wrong treatment site (excluding, for permanent implants, seeds that were implanted in the correct site but migrated outside the treatment site);
- (2) Involving a sealed source that is leaking;
- (3) When, for a temporary implant, one or more sealed sources are not removed upon completion of the procedure; or

(4) When the calculated administered dose differs from the prescribed dose by more than 20 percent of the prescribed dose.

f. A diagnostic radiopharmaceutical dosage, other than quantities greater than 30 microcuries of either sodium I-125 or I-131:

(1) Involving the wrong patient or human research subject, wrong radiopharmaceutical, wrong route of administration, or when the administered dosage differs from the prescribed dosage; and

(2) When the dose to the patient or human research subject exceeds 5 rems effective dose equivalent or 50 rems dose equivalent to any individual organ.

Nonstochastic Effects

Also called a deterministic effect. A health effect, the severity of which varies with dose, and for which a threshold is believed to exist. Radiation induced cataract formation and skin erythema are examples of nonstochastic effects.

Occupational Dose

a. The dose received by an individual in a restricted area or in the course of employment in which the individual's assigned duties involve exposure to ionizing radiation from NRC- and non-NRC licensed radioactive materials as well as from machine produced ionizing radiation, whether in the possession of the owner or the radiation source (licensee) or other individual.

b. Occupational dose does not include dose received from background radiation, as a patient from medical or dental procedures, from voluntary participation in human research programs, or as a member of the general public.

Occupationally Exposed Individual

Any individual who receives an occupational dose of radiation as a result of employment in an occupation involving the use of radioactive material or equipment capable of producing ionizing radiation.

Principal User

An individual who possesses adequate training and experience with radioactive materials and bears ultimate responsibility for the ordering, receiving (from the HPO), storing, and inventory of authorized

materials. He or she is solely responsible for the implementation of the radiation protection procedures necessary to ensure the safe use of the materials specified in the authorization.

NRC

Nuclear Regulatory Commission.

RAM

Radioactive Material.

RCC

Radiation Control Committee.

RPO

Radiation Protection Officer.

a. A technically competent person designated by management to evaluate safety procedures and to supervise the application of radiation protection regulations.

b. The individual identified as the Radiation Safety Officer on a Nuclear Regulatory Commission license.

Radiation Sources

Material, equipment, or devices which spontaneously generate or are capable of generating ionizing radiation. They include the following:

a. Nuclear reactors.

b. Medical or dental radiographic or fluoroscopic x-ray systems.

c. Particle generators or accelerators.

d. Certain electromagnetic generators, such as klystron, magnetron, rectifier, cold-cathode, and other electron tubes operating at electrical potentials that result in the production of x-rays of such energy as to be of radiological concern.

e. X-ray diffraction, industrial radiographic, and spectrographic equipment.

f. Electron microscopes.

g. Electron-beam welding, melting, and cutting equipment.

h. Nuclear moisture or density gauges.

- i. Radioactive materials.
- j. Natural or accelerator-produced radioactive materials.
- k. Byproduct materials.
- l. Source materials.
- m. Special nuclear materials.
- n. Fission products.
- o. Materials containing induced or deposited radioactivity.
- p. Radioactive commodities.

Radiation Protection Survey (Radioactive Materials)

The evaluation of various locations to determine existing or potential radiation hazards associated with the use of radioactive materials.

Radiation Protection Survey (X-ray Producing Devices)

An evaluation, under specified conditions, of existing or potential radiation hazards associated with the use of x-ray producing devices.

Radionuclide

A radioactive species of atom characterized by its mass number (A), atomic number (Z), and nuclear energy state, provided that the mean life of the that state is long enough to be observable.

Radioactive Waste

- a. Solid, liquid, and gaseous materials that are radioactive or become radioactive and for which there is no further use.
- b. Property contaminated with radioactive materials to the extent that decontamination is economically unsound.

Recordable Event

The administration of:

- a. A radiopharmaceutical or radiation without a written directive where a written directive is required;
- b. A radiopharmaceutical or radiation where a written directive is required without daily recording

of each administered radiopharmaceutical dosage or radiation dose in the appropriate record;

c. A radiopharmaceutical dosage greater than 30 microcuries of either sodium iodide I-125 or I-131 when both:

(1) The administered dosage differs from the prescribed dosage by more than 10 percent of the prescribed dosage, and

(2) The difference between the administered dosage and prescribed dosage exceeds 15 microcuries;

d. A therapeutic radiopharmaceutical dosage, other than sodium iodide I-125 or I-131, when the administered dosage differs from the prescribed dosage by more than 10 percent of the prescribed dosage;

e. A teletherapy radiation dose when the calculated weekly administered dose exceeds the weekly prescribed dose by 15 percent or more of the weekly prescribed dose; or

f. A brachytherapy radiation dose when the calculated administered dose differs from the prescribed dose by more than 10 percent of the prescribed dose.

Restricted Area

An area, access to which is limited by the commanders of DA and DLA installations and activities for the purpose of protecting individuals from undue risks associated with exposure to ionizing radiation-producing sources, devices, and radioactive materials. Restricted areas do not include areas used as residential quarters; however, a separate room in a residential building may be set aside as a restricted area.

SOP

Standing Operating Procedure

Sealed Source

Radioactive materials sealed in an impervious container designed to prevent dispersion under normal use.

Shallow-dose Equivalent

The external exposure of the skin or any extremity which is taken as the dose equivalent at a tissue depth of 0.007 cm (7 mg/cm² the average depth of the germinal cell layer) averaged over an area of 1 cm².

Shielding Evaluation

An evaluation of the design or modification plans for a fixed radiologic facility to preclude the occurrence of radiation hazards.

Source Material

a. Uranium, thorium, or any combination of uranium or thorium in any physical or chemical form; or

b. Ores which contain by weight one-twentieth of 1 percent (0.05%) or more of uranium, thorium, or any combination of uranium and thorium.

c. Source material does not include:

(1) Special nuclear material.

(2) Plutonium, ²³³U, uranium enriched in the isotope 233 or in the isotope 235. Any other material the NRC determines to be special nuclear material as defined by 10 CFR Part 20.

(3) Special nuclear material does not include source material.

Stochastic Effects

Health effects that occur randomly and for which the probability of the effect occurring rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects.

Total Effective Dose Equivalent (TEDE)

The sum of the H_d (for external exposure) and the CEDE (for internal exposure) expressed in units of either rem or Sv.

TLD

Thermoluminescent Dosimeter.

Technician

An individual who works under the direct supervision of a Principal User or co-worker for the purpose of performing certain routine duties associated with the use of the radioactive materials specified in the authorization.

Trainee

An individual who works under the direct supervision of a Principal User or co-worker for the purpose of obtaining the necessary training and experience to

qualify for eventual status as a co-worker or Principal User.

Weighting Factor (w_T)

The decimal fraction specified for an organ or tissue whose magnitude is the quotient of the risk of stochastic effects resulting from the irradiation of that organ or tissue (T) to the total risk or stochastic effects when the whole body is irradiated uniformly. The w_T values used for calculating the HE are found in 10 CFR Part 20.

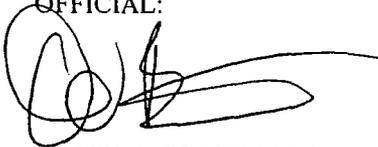
Whole Body

The head, trunk (including male gonads), arms above the elbow, or legs above the knee.

The proponent of this regulation is Preventive Medicine Service, Health Physics Office. Users are invited to send suggestions and comments on DA Form 2028 (Recommend Changes to Publications and Blank Forms) to Commander, WRAMC, ATTN: MCHL-HP, Washington, DC 20307-5001.

FOR THE COMMANDER:

OFFICIAL:



DAVID A. BITTERMAN
Major, MS
Executive Officer

BRIAN P. FOLEY
Colonel, MS
Deputy Commander for
Administration

DISTRIBUTION:

A

This is to acknowledge the receipt of your letter/application dated

10/15/2001, and to inform you that the initial processing which includes an administrative review has been performed.

RENEW 08-01738-03 There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

Please provide to this office within 30 days of your receipt of this card

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 1 3 0 4 6 5.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER WILLIAM B. JOHNSON, Ph.D.		2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE: NOT APPLICABLE		
3. CERTIFICATION				
SPECIALTY BOARD A	CATEGORY B	MONTH & YEAR CERTIFIED C		
NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE		
4. TRAINING RECEIVED IN BASIC RADIOACTIVE HANDLING TECHNIQUES				
FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE & LENGTH OF TRAINING		
		LECTURE/ LABORATORY COURSES (Hours) C	SUPERVISED LABORATORY EXPERIENCE (Hours) D	
a. RADIATION PHYSICS AND INSTRUMENTATION	1) Univ of North Carolina, Chapel Hill, NC, 1980-1983 (3 years) 2) Tulane, New Orleans, LA, 1976 (1 year) 3) Ft. Belvoir, VA, 1970-1971 (1 year)	80 60 168	92	
b. RADIATION PROTECTION	1) Reference 1 above 2) Reference 3 above	140 80	60 120	
c. MATHEMATICS IN THE USE AND MEASUREMENT OF RADIOACTIVITY	1) Reference 1 above 2) Reference 3 above	125 60		
d. RADIATION BIOLOGY	1) Reference 1 above 2) Reference 3 above	40 40		
e. RADIOPHARMACEUTICAL CHEMISTRY	1) Reference 1 above 2) Reference 3 above	200	60 20	
5. EXPERIENCE WITH RADIATION. (Actual use of Radioisotopes or Equivalent Experience)				
ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE GAINED	DURATION OF EXPERIENCE	TYPE OF USE
SM-1 Nuclear Power Reactor	1000 KW	SM-1, Ft. Belvoir, VA	1971 (1 year)	Health Physics Surveys; Reactor operations; Calibration

5. EXPERIENCE WITH RADIATION.(Actual use of Radioisotopes or Equivalent Experience)				
ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE GAINED	DURATION OF EXPERIENCE	TYPE OF USE
²³⁵ U ²³⁸ U ²³⁹ Pu Pu-Be ²⁴¹ Am ¹³⁷ Cs ³ H	216 gm unsealed & soln. sources 3 gm unsealed source 43 gm, liquid sources 3 Ci, Sealed 600 mCi, Sealed 120 Ci, Sealed 110 Ci, Sealed	U.S. Army Environmental Hygiene Agency Aberdeen Proving Ground, MD NRC Byproduct Material License	1973-1974 (1 year)	Health Physics Surveys; Alternate RSO; Calibration
Atomic No. 3-83 ³ H ¹³¹ I ¹²⁵ I ¹³ C	5 mCi each 10 mCi, liquid 10 mCi, liquid 1 Ci, liquid 1 Ci, liquid	US Army Medical Lab Ft. Sam Houston, TX Radiation Safety Officer NRC Byproduct Material License (Medical)	1974-1975 (1 year)	RSO, RIA kits, Iodinations, Health Physics Surveys; Wet Chemistry procedures
⁹⁹ Mo/ ^{99m} Tc Generator	2 Ci	North Carolina Memorial Hospital Chapel Hill, NC	1982 (1 month)	Clinical Training
Atomic No. 3-83 10 CFR 35 Gp I-II Gp III Gp IV-V ¹³³ Xe ¹³⁷ Cs ¹⁵³ Gd	25 mCi each As needed 3 Ci each As needed 40 mCi 131 Ci 2 Ci	Dwight D. Eisenhower Army Medical Center, Fort Gordon, GA Radiation Safety Officer for Hybrid Broad Scope NRC Materials License (Medical) USNRC No. 10-12044-03	May 1983-June 1989 (6 years)	RSO, Radiation Safety Surveys, Medical Physics Surveys, Calibration
Atomic No. 3-83 ¹⁴ C, ³ H, ⁹⁹ Mo, ^{99m} Tc ³² P, ¹²⁵ I ¹³⁷ Cs	15 Ci total, ≤ 200 mCi each 5 Ci each, any form 1 Ci each, any form 4200 Ci, sealed source	Uniformed Services University of the Health Sciences, Bethesda, MD Radiation Safety Officer for Broad Scope Type A NRC Material License (Medical) USNRC No. 19-23344-01	May 1989-June 1992 (3 years)	RSO, Health Physics Surveys, Calibration