



**DEFENSE INTELLIGENCE AGENCY
MISSILE AND SPACE INTELLIGENCE CENTER
REDSTONE, ARSENAL, AL 35989-5500**



U-197,007/04/MSM-2

TO: Licensing Assistant Section
Nuclear Materials Safety Branch
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

04 DEC 30 P 1:12

RECEIVED
REGION 1

SUBJECT: Application for Renewal of Nuclear Regulatory Commission License

Dear Sir or Madam:

03033658

Enclosed are two copies of an application to renew NRC License 01-25316-01 currently granted to the Defense Intelligence Agency, Missile & Space Intelligence Center.

In the interest of national security we request this license not be subject to license term rule as stated in 10 CFR 30.36, 4042, 70.38 and request a ten year renewal period.

Point of contact for this action is Arthur Keith Rose, CHP (256) 313-2114, Fax (256) 313-2111 or email keith.rose@redstone.army.mil.

FOR THE DIRECTOR:

Patricia C. Brown
Patricia C. Brown
Acting Director

2 Enclosure a/s

136222

NMSS/RGNI MATERIALS-002

APPLICATION FOR MATERIAL LICENSE

Estimated burden per response to comply with this mandatory collection request: 7 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-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollect@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, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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
81 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 BRANCH
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 78011-8064

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

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

Defense Intelligence Agency
Missile & Space Intelligence Center
MSM, Building 4545, Fowler Road
Redstone Arsenal, AL 35898-5500

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Defense Intelligence Agency
Missile & Space Intelligence Center
Building 4545, Fowler Road
Redstone Arsenal, AL 35898-5500

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Arthur Keith Rose, CHP / Robert Thompson

TELEPHONE NUMBER

(256) 313-2114 / (256) 313-7646

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

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. LICENSE 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 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 82 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO

CERTIFYING OFFICER -- TYPED/PRINTED NAME AND TITLE
Clyde E. Walker, Director, Defense Intelligence Agency

SIGNATURE
Patricia C. Brown

DATE
29 Dec 04

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			\$ <input type="text"/>	<input type="text"/>	
APPROVED BY				DATE	
					136222

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SUPPLEMENT I

NATIONAL ENVIRONMENTAL POLICY ACT DOCUMENTATION

The enclosed Record of Environmental Consideration applies to possession and storage of radioactive material in enclosed facilities. Documentation of removal and possession which are not conducted in enclosed facilities will be addressed in separate environmental assessments on a case by case basis.

DEPARTMENT OF THE ARMY
UNITED STATES ARMY GARRISON,
Redstone Arsenal, Alabama 35898-5000
RECORD OF ENVIRONMENTAL CONSIDERATION
CONTROL NUMBER REC- 1016-05

WORK ORDER #

TRACKING #

1. TITLE: Application for Renewal of a Type A Nuclear Regulatory Commission License of Broad Scope and Special Nuclear Material of Less Than Critical Mass.

2. DESCRIPTION OF PROPOSED ACTION:

This license will authorize the Defense Intelligence Agency, Missile & Space Intelligence Center to remove and store previously manufactured military and civilian commodities of foreign origin which contain radioactive material at Redstone Arsenal, where material will be staged. Transient possession and storage of radioactive materials will be performed in controlled facilities. No unsealed sources will be received and no destructive testing will be performed under this Record of Environmental Consideration. The ordinary removal and handling of the radioactive material would not result in the release of radioactive material into the environment. Radioactive material will be stored in the locked AMCOM Radioactive Material Storage area and disposed of as radioactive waste in accordance with AR 11-9, The Army Radiation Safety Program.

3. ANTICIPATED DATE OF PROPOSED ACTION: 20 December 2004

4. IT HAS BEEN DETERMINED THAT THIS ACTION:

a. IS SUPPORTED BY THE EXISTING ENVIRONMENTAL ASSESSMENT: ____;
ENVIRONMENTAL IMPACT STATEMENT: ____;

ENTITLED:

AND DATED

b. PROPOSED ACTION IS EXEMPT FROM THE REQUIREMENTS OF NEPA:
YES NO

C. SIMILARITY TO ACTIONS PREVIOUSLY EXAMINED AND FOUND TO MEET THE CRITERIA FOR USING A REC: This action is similar to actions previously examined and found to meet the criteria for using a REC.

5. COORDINATION WITH OTHER AGENCIES: (LIST AGENCIES IF ANY)

Directorate of Public Works
Directorate of Environment and Safety

RECORD OF ENVIRONMENTAL CONSIDERATION (CONTINUED)

CONTROL NUMBER: REC 10/6-05

6. ENVIRONMENTAL IMPACT/IMPACTS OF PROPOSED ACTION: SEE APPENDIX A.

7. SITE LOCATION MAP (8 1/2" BY 11") OF THE PROPOSED PROJECT IS AT APPENDIX B in a copy of the work order(s).

8. CONCLUSION: THIS ACTION HAS BEEN EVALUATED IN ACCORDANCE WITH PART II 32 CFR 651 SECTION 651.29 (AR 200-2). IT HAS BEEN DETERMINED THAT THIS ACTION DOES NOT INDIVIDUALLY OR CUMULATIVELY HAVE A SIGNIFICANT EFFECT ON THE HUMAN ENVIRONMENT. NO EXTRAORDINARY CIRCUMSTANCES EXIST AS DEFINED IN SECTION 651.29 PARAGRAPH (b)(1) THROUGH (14). THERE WILL BE NO ENVIRONMENTALLY CONTROVERSIAL CHANGES TO EXISTING ENVIRONMENTAL CONDITIONS. THERE ARE NO CIRCUMSTANCES WHICH WOULD REQUIRE AN ENVIRONMENTAL ASSESSMENT (EA) OR AN ENVIRONMENTAL IMPACT STATEMENT (EIS) UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA). THIS ACTION QUALIFIES AS CATEGORICAL EXCLUSION(S) IN APPENDIX B TO PART 651 SECTION II (b)(4) and (b) (5) PER PART II 32 CFR PART 651 (AR 200-2), AND MEETS THE SCREENING CRITERIA IN SECTION 651.29 (a) THROUGH (e).

9. CATEGORICAL EXCLUSION:

(b) (4)

(b) Administration/operation activities:

(4) Proposed activities and operations to be conducted in an existing non-historic structure which are within the scope and compatibility of the present functional use of the building, will not result in a substantial increase in waste discharged to the environment, will not result in substantially different waste discharges from current or previous activities, and emissions will remain within established permit limits, if any (REC required).

(h) (5)

(h) Hazardous materials/hazardous waste management and operations:

(5) Research, testing, and operations conducted at existing enclosed facilities consistent with previously established safety levels and in compliance with applicable federal, state, and local standards.

10. HOW THIS REC MEETS THE SCREENING CRITERIA:

- (1) The action has not been segmented.
- (2) No exceptional circumstances exist.
- (3) Two CX encompass the proposed action, (b) (4) and (h) (5).

11. THIS DOCUMENT **DOES NOT** RELIEVE THE PROPONENT OF COMPLIANCE WITH APPLICABLE FEDERAL AND STATE LAWS AND REGULATIONS

RECORD OF ENVIRONMENTAL CONSIDERATION (CONTINUED)
CONTROL NUMBER: REC 1016-05

PROPONENT:


Richard L. Stamps

Date 17 Dec 2004

Chief, Office for Program Management
(Title)

MSM
(Office Symbol)


Prepared by Robert E. Thompson

Date 17 Dec 2004

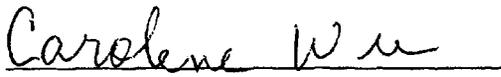
CONCURRENCES:

RSA Environmental Office Review

N/A (RE)

Date N/A (RE)

Other Environmental Review


CAROLENE WU, AMSAM-RA-DES-NR
NEPA Coordinator

Date 12-21-04

RECORD OF ENVIRONMENTAL CONSIDERATION (CONTINUED)
CONTROL NUMBER: REC 1016-05

CONCURRENCES:



DANIEL J. DUNN, Chief
Natural Resources Division

Date: 12/21/04



TERRY DE LA PAZ, Chief
Installation Restoration Division

Date: 22 Dec 04



CRAIG T. NORTHRIDGE, Chief
Installation Compliance Division

Date: 12/21/04

APPROVED BY:



TERRY W. HAZLE
Director, Directorate of
Environment and Safety
AMSAM-RA-DES

Date: 12/21/04

APPENDIX A

ENVIRONMENTAL QUALITY CONSIDERATIONS CHECKLIST
(Complete checklist and attach to REC)1. DOES PROPOSAL CONFORM WITH INSTALLATION MASTER PLAN? Yes X NO 2. WOULD THE PROPOSED PROJECT ALTER LAND USE ON THE
INSTALLATION? Yes No X3. DESCRIBE PROJECT ACTIVITIES THAT COULD POSSIBLY AFFECT THE ARCHAEOLOGICAL AND/OR CULTURAL RESOURCES AND THE QUALITIES OF AIR, LAND AND WATER ON REDSTONE ARSENAL (RSA), E.G., CLEARING, DIGGING OR LEVELING. THESE ACTIONS MUST BE COORDINATED WITH THE RSA ENVIRONMENTAL OFFICE.

None

4. PRIOR USE AND CONDITION OF THE PROPERTY AND/OR EQUIPMENT INVOLVED:
Building(s) already being used as described in NRC License 01-25316-01.

5. PROPOSED USE OF THE PROPERTY, EQUIPMENT, AND/OR COMPLETED PROJECT:

This license will authorize the Defense Intelligence Agency, Missile & Space Intelligence Center to receive, remove and store previously manufactured military and civilian commodities of foreign origin which contain radioactive material at Redstone Arsenal, where material will be staged. Transient possession and storage of radioactive materials will be performed in controlled facilities. No unsealed sources will be received and no destructive testing will be performed under this Record of Environmental Consideration. The ordinary removal and handling of the radioactive material would not result in the release of radioactive material into the environment. Radioactive material will be stored in the locked AMCOM Radioactive Material Storage area and disposed of as radioactive waste in accordance with AR 11-9, The Army Radiation Safety Program.

6. AREAS OF POTENTIAL ENVIRONMENTAL IMPACT DURING IMPLEMENTATION (e.g., construction phase, equipment placement/replacement phase, etc.) of proposed action. 1=improvement, 2=no change, 3=minor adverse impact, 4=moderate adverse impact, 5=major adverse impact:

- | | |
|--|------------------|
| a. Potential to cause air pollution. | 1 <u>2</u> 3 4 5 |
| b. Potential to cause water pollution. | 1 <u>2</u> 3 4 5 |
| c. Potential to impact on the quality or quantity of groundwater. | 1 <u>2</u> 3 4 5 |
| d. Potential to affect wetlands, floodplain, wild and scenic rivers. | 1 <u>2</u> 3 4 5 |
| e. Potential for discharge or release of hazardous substance. | 1 <u>3</u> 4 5 |

- f. Potential to cause soil contamination. 1(2)3 4 5
- g. Potential to violate a safety, public health, or noise standard. 1(~~2~~)3 4 5
- h. Potential to impact on protected species or their habitat. 1(2)3 4 5
- i. Potential to affect cultural resources that are either on or eligible for the National Register, or unstudied. 1(2)3 4 5
- j. Potential effects upon labor force. 1(2)3 4 5
- k. Potential to impact upon recreational areas and/or prime farmland. 1(2)3 4 5
- l. Potential to affect energy demand. 1(2)3 4 5

m. Potential environmental controversy involved with project:

(1) Local Yes__ No__ X__

(2) National Yes__ No__ X__

n. Potential to violate Federal, State, or local law/regulation designed to control air pollution. Yes__ No__ X__

o. Potential to violate Federal, State or local law/regulation designed to control water pollution. Yes__ No__ X__

p. Potential involvement with contaminated areas and/or material. Yes__ No__ X__

7. AREAS OF POTENTIAL ENVIRONMENTAL IMPACT DURING OPERATION PHASE OF PROPOSED ACTION. 1=improvement, 2=no change, 3=minor adverse impact, 4=moderate adverse impact, 5=major adverse impact:

- a. Potential to cause air pollution. 1 2(3) 4 5
- b. Potential to cause water pollution. 1(2)3 4 5
- c. Potential to impact on the quality or quantity of groundwater. 1(2)3 4 5
- d. Potential to affect wetlands, floodplain, wild and scenic rivers. 1(2)3 4 5
- e. Potential for discharge or release of hazardous substance. 1 2(3) 4 5
- f. Potential to cause soil contamination. 1 2(3) 4 5
- g. Potential to violate a safety, public health, or noise standard. 1(~~2~~)3 4 5

h. Potential to impact on protected species or their habitat. 1 2 3 4 5

i. Potential to affect cultural resources that are either on or eligible for the National Register, or unstudied. 1 2 3 4 5

j. Potential effects upon labor force. 1 2 3 4 5

k. Potential to impact upon recreational areas and/or prime farmland. 1 2 3 4 5

l. Potential to affect energy demand. 1 2 3 4 5

m. Potential environmental controversy involved with project:

(1) Local Yes ___ No ___ X ___

(2) National Yes ___ No ___ X ___

n. Potential to violate Federal, State, or local law/regulation designed to control air pollution. Yes ___ No ___ X ___

o. Potential to violate Federal, State or local law/regulation designed to control water pollution. Yes X ___ No ___

p. Potential involvement with contaminated areas and/or material. Yes X ___ No ___

8. PLANNED MITIGATION OF ADVERSE IMPACT:

All radioactive material removed from manufactured items will be surveyed immediately for the presence of contamination. In addition, items will be double-bagged, taped shut and labeled as to isotope, amount and any other information necessary so that any personnel in the area may take proper precautions when handling.

SUPPLEMENT ii

GLOSSARY OF ABBREVIATIONS

1. ALARA – As Low As Reasonably Achievable
2. AR - Army Regulation
3. CFR - Code of Federal Regulations
4. DA - Department of the Army
5. DIA – Defense Intelligence Agency
6. DOD - Department of Defense
7. DOE - Department of Energy
8. FM - Foreign Material
9. HP – Health Physicist
10. IAW - in accordance with
11. AMCOM - US Army Aviation and Missile Command
12. MSIC - Missile and Space Intelligence Center
13. NIST - National Institute of Standards and Technology
14. NBC - Nuclear, Biological and Chemical
15. NRC - Nuclear Regulatory Commission
16. RCC - Radiation Control Committee
17. RP – Radiation Program
18. RSO - Radiation Safety Officer
19. RSP - Radiation Safety Program
20. RSS – Radiation Safety Supervisor

**SUPPLEMENT 3.0
(NRC Form 313, Item 3)**

Address(es) Where Licensed Material Will Be Used or Possessed

Material may be used or possessed at Redstone Arsenal, AL and at temporary sites anywhere in the United States by personnel as approved by the DIA, MSIC RCC. The job site will include those of DOD, NRC, DOE, NASA, and/or contractor locations.

All licensed material will be in the form of painted disks, sealed tubes, sealed calibration sources, plated foils, and other previously manufactured military and civilian commodities of foreign origin.

The need and approval for possession of licensed material at off site locations will be determined by the DIA, MSIC RCC after careful consideration of off site capabilities. The DIA, MSIC RCC will ensure proper oversight of off site operations by personnel trained in radiation protection. If the off site location does not have a permanently assigned RSO, a radiation safety supervisor (RSS) will be designated to ensure compliance with license conditions, AR 11-9 and additional restrictions imposed by the NRC.

The RSS will have on-the-job or formal training commensurate with the types, quantity and form of radioactive material under his supervision. When determined necessary by the DIA, MSIC RCC, a Health Physicist (HP) will be sent to the off site location to provide initial/termination or periodic training and support. A HP will also be available on call, in the event of an emergency or other condition which may require his presence or advice. An on-site inspection by a HP may also be performed when determined necessary by the DIA, MSIC RCC.

Unless otherwise specifically stated, all aspects of the possession and use of radioactive materials by DIA, MSIC, its subordinates, and designated individuals at temporary locations will be as prescribed in Army Regulation 11-9 (See supplement 10.0).

The control described above will be accomplished by:

a. Requiring that all requests for material removal/storage at locations other than DIA, MSIC will be forwarded directly to the Chairperson, DIA, MSIC RCC. The DIA, MSIC RCC will review and act on each request on a case by case basis.

b. Reviewing and approving the removal/storage of material based on the appointment of a RSS sufficiently trained to perform his duties.

SUPPLEMENT 5.0
(NRC Form 313, Item 5)

RADIOACTIVE MATERIAL

ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM		MAXIMUM AMOUNT WHICH WILL BE POSSESSED AT ANY ONE TIME
Any by-product material with atomic numbers 1-52, inclusive, and 54-84 inclusive.		NA	Each radionuclide shall not exceed the amount listed in 10 CFR 33.100 Schedule A, Col 1. The sum of the ratio shall not exceed unity.
Hydrogen 3	Sealed in Glass Ampoules or as Activated Paint	NA	500 curies total
Cobalt 60	Sealed Sources	NA	10 millicuries total
Nickel 63	Foils, Plated Sources or Sealed Sources	NA	1 curie total
Krypton 85	Sealed Sources	NA	1 curie total
Strontium 90	Sealed Sources	NA	100 millicuries total
Cesium 137	Sealed Sources	NA	100 millicuries total
Promethium 147	Sealed Sources	NA	1 curie total
Americium 241	Foils, Plated Sources, or Sealed Sources	NA	10 millicuries
Special Nuclear Material	Sealed Sources Metal or Plated Metal	NA	██████████ total

**Receipt of material exceeding these limits will require immediate notification of the NRC and filing of a license amendment

**SUPPLEMENT 6.0
(NRC Form 313, Item 6)**

PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED

All licensed material listed in Supplement 5 (Item 5) will be in the form of painted disks, sealed tubes, sealed calibration sources and/or plated foils in previously manufactured military and civilian commodities of foreign origin.

Licensed materials will be received, possessed, and stored until disposal in accordance with current applicable Federal, State, and Army regulations and requirements and guidance provided by the DOD Radioactive Waste Manager located at the U.S. Army Field Services Command (AFSC), Rock Island, IL.

No fabrication using loose or unsealed materials will be performed. No willful destructive testing of items containing radioactive materials will be conducted under this license. If destructive testing is requested it will be conducted by other agencies under separate NRC license.

**SUPPLEMENT 7.0
(NRC Form 313, Item 7)**

**INDIVIDUALS RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR
TRAINING AND EXPERIENCE**

- Item 7.1 Appointment of Radiation Safety Officer and Alternate
- Item 7.2 Resumes of Radiation Safety Officer and Alternate
- Item 7.3 Appointment of DIA, MSIC Radiation Control Committee
- Item 7.4 Organizational Chart

Item 7.1

Appointment Orders for Radiation Safety Officer and Alternate
Radiation Safety Officer

The Radiation Safety Officer's authority and responsibilities are outlined in AR 11-9, The U.S. Army Radiation Safety Program and AMCOMR 11-1, U.S. Army Aviation and Missile Command Radiation Safety Program. The RSO and alternate are responsible for implementing actions which ensure the radiation safety at Redstone Arsenal, AL. The RSO establishes, implements, and enforces those procedures deemed necessary to a Radiation Safety Program which effectively establishes a means by which radioactive materials can be used safely and in compliance with appropriate regulations.

The RSO or his representative has the responsibility and authority to immediately order the suspension of any activity which he believes to be a threat to health, safety and property.

The Defense Intelligence Agency, Missile & Space Intelligence Center will use the AMCOM RSO as the RSO for this license under Support Agreement W31G3H-04337-545. The control, functions, responsibilities and authority will be the same as delineated in AR 11-9 and AMCOM Regulation 11-1.



**DEFENSE INTELLIGENCE AGENCY
MISSILE AND SPACE INTELLIGENCE CENTER
REDSTONE, ARSENAL, AL 35989-5500**



U-198,008/04/MSM-2

TO: U.S. Army Aviation Missile Command
ATTN: AMSAM-SF-RP (Safety Office)
Redstone Arsenal, AL 35898-5130

SUBJECT: Appointment of Radiation Safety Officer and Alternate for the Defense Intelligence Agency, Missile and Space Intelligence Center, Redstone Arsenal, AL

1. The appointment of the Defense Intelligence Agency (DIA), Missile and Space Intelligence Center (MSIC) Radiation Safety Officer (RPO) and Alternate is as follows:
 - a. RSO: Arthur K. Rose, Health Physicist, AMCOM Radiation Safety Officer, (256) 313-2114, Redstone Arsenal, Alabama 35898-5200.
 - b. Alternate RSO: Robert E. Thompson, Safety Officer, DIA/MSIC Radiation Safety Officer, (256) 313-7646, Redstone Arsenal, Alabama 35898-5500.
2. Authority: Army Regulation 40-5, AR 11-9, AMCOM Reg 11-1, and Inter-service Support Agreement: Radiation, Safety Office.
3. Purpose: Responsible for the oversight of the DIA, MSIC Ionizing Radiation Protection Program at Redstone Arsenal, Alabama and at storage test locations as specified by the Nuclear Regulatory Commission Licensing Agency.
4. Period: Indefinite.
5. Effective Date: 27 December 2004

FOR THE DIRECTOR:


Patricia C. Brown
Acting Director

Item 7.2

Resumes of Radiation Safety Officer and Alternate

**Arthur K. Rose, CHP
Health Physicist**

**U.S. Army Aviation and Missile Command
Redstone Arsenal, AL 35898-5000**

**Commercial 256-313-2114
DSN 897-2114**

1. Education:

a. University of North Alabama, Florence, AL, December [REDACTED] Degree: B.S.
Major: Biology Minor: Chemistry

b. Georgia Institute of Technology, Atlanta, GA, 1986 Biology 6730, "Biological Effects of Radiation"

2. Professional Experience:

a. May 1998 to present, U.S. Army Aviation and Missile Command (AMCOM), Health Physicist.

Serves as AMCOM Radiation Safety Officer to implement the AMCOM Radiation Safety Program in support of Redstone Arsenal installation and subordinate activity operations for the use of radioactive materials, radioactive commodities, radiation-producing devices, lasers, and radiofrequency radiation sources used in aviation and missile systems. Provides technical assistance to AMCOM and PEO, Aviation systems on ionizing and nonionizing (lasers, microwaves, etc.) radiation issues. Establishes and maintains safe practices and standards for design, development, production, movement, storage, use, and maintenance of radioactive materials/devices used in research and development activities and for materiel intended for incorporation into the Army inventory. Advises the commander on issues relating to the control of hazards associated with the use of ionizing and nonionizing radiation sources.

b. March 1991 to May 1998, U.S. Army Test, Measurement, and Diagnostic Equipment Activity (USATA), Physicist.

Served as Project Leader and Technical Expert in Physics. Included research, design, development, and application of technology needed to advance state-of-the-art calibration standards and test measurement and diagnostic equipment. Responsible for procurement of Health Physics-related standards and equipment such as Bicon Extremity Dosimetry System, Counting Lab Equipment, Survey Meters, Liquid Scintillation Standards, Beta/gamma Sources, Computer Controllers, and Glow Curve Interface Boards. Also responsible for the testing and acceptance of Health Physics-related standards and equipment.

c. September 1989 to March 1991, U.S. Army Test, Measurement, and Diagnostic Equipment Activity (USATA), Health Physicist.

Served as Alternate Radiation Control Officer for the U.S. Army Test, Measurement, and Diagnostic Equipment Activity. Responsibilities included managing and operating the USATA Radiation Protection Program worldwide. Provided technical support to the Army Primary Nucleonic Calibration Program, the worldwide Army RADIAC Program, and the Army Ionizing Dosimetry Program. Ensured that each radiological operation within the U.S. Army TMDE Support Activity had an adequate radiation safety program, proper safety equipment, and a facility that met the required radiation safety standards for its assigned mission. Served as the Alternate Radiation Protection Officer for the U.S. Army Primary Nucleonics Laboratory. Served as a consultant and advised radiation protection personnel on matters involving health physics, radioactive material disposal, and environmental radiological monitoring. Provided training to radioactive material users and ancillary personnel.

d. February 1985 to September 1989, Tennessee Valley Authority, Muscle Shoals, AL, Health Physicist.

Directed health physics activities at TVA's Power Service Shops. Responsibilities included participating in the planning of activities to incorporate good radiation protection practices and to ensure exposures were maintained as low as reasonably achievable, acquiring and supervising technicians, training technicians and workers, preparing radioactive shipments, performing calibration checks on instrumentation, changing out Thermal Luminescent Dosimeters (TLDs), performing surveys, providing health physics coverage to workers, and maintaining QA records of activities.

Provided support to by-product material license holders within Nuclear Power (approximately 15 licenses). Support included assistance in preparing application for license and/or license amendments, interpretation of license requirements, and supervision and conduct of direct health physics support.

Conducted inspections of licensed activities (including incident investigations/reports). Developed, wrote, and reviewed for technical accuracy procedures which directed the health physics activities supporting by-product license holders. Provided health physics training to radioactive material users.

Coordinated the personnel dosimetry program with license holders. Investigated lost or damaged TLDs and assigned dose based on investigation. Served as a Radiological Emergency Plan field team member during plant emergency exercises; assisted in the maintenance of emergency equipment.

Served as a member of TVA's Health Physics Instrument Committee from April 1984 to November 1987. As a member, conducted evaluations of various instruments and made recommendations to the committee. Operated TVA's whole body counter from December 1986 to September 1988.

Assigned briefly as Plant Health Physicist at Bellefonte Nuclear Plant.

e. April 1984 to February 1985, Tennessee Valley Authority, Muscle Shoals, AL, Health Physics Technician.

Conducted/directed health physics surveys at TVA facilities that use radioactive

materials or radioactive producing equipment. Coordinated these surveys with the appropriate supervisors in the various divisions. Made recommendations for corrective actions if necessary. Secured accurate and adequate field data and prepared reports and survey memoranda. Provided training to paramedical personnel on general health physics and handling of contaminated patients from nuclear plants. Interpreted and applied regulations regarding transportation of radioactive materials and use of medical X-rays. Served as a member of the radiological emergency response team.

f. January 1983 to April 1984, Tennessee Valley Authority, Browns Ferry Nuclear Plant, Decatur, AL, Health Physics Training Instructor.

Conducted 2-day training program for new personnel, 4-hour retraining for persons requiring reorientation, and presented special training if needed. Conducted 40-hour training programs for senior contract health physics technicians and technician aids. Scheduled training classes with a minimum of conflict with plant work requirements. Developed lesson plans and exams to meet Institute of Nuclear Power Operations (INPO) approved format.

g. April 1982 to January 1983, Tennessee Valley Authority, Muscle Shoals, AL, Health Physicist.

Conducted training for TVA's 2-month preparatory class and 6-month health physics technician training class. Delivered lectures involving nuclear physics, college-level mathematical calculations, etc. Provided specialized training in specific areas of health physics such as BWR and PWR plant systems. Assisted in the procurement of supplies and health physics laboratory equipment. Acted as liaison between training section and the nuclear power plants to determine their health physics training needs. Developed lesson plans and exams to meet INPO approved format.

Results: Graduated 22 well-trained health physics technician trainees for two operating nuclear plants. Received excellent service review.

h. December 1979 to April 1982, Tennessee Valley Authority, Browns Ferry Nuclear Plant, Decatur AL, Health Physics Technician.

Served as shift coordinator. As shift coordinator was responsible for scheduling and assigning routine and special radiation and contamination surveys and issuing special work permits. Worked in the plant lab and all outage control points during major outages.

3. Certification: Certified by the American Board of Health Physics, November 2002.

4. Formal Training in Radiation Protection Methods, Measurements, and Effects

a. TVA Health Physics Technician Training Course (6-month Health Physics Technician Training Course involving nuclear physics, instrumentation, and plant systems.)

b. TVA Radioactive Material Shipment Workshop.

c. Regulatory Compliance Workshop (Nuclear Energy Waste Management Consultants)

d. TVA REP Training, Environmental Monitoring Van.

e. TVA Mobile Whole Body Counter System Course.

f. TVA Health Physics Technician Continuing Education (40 hours).

g. TVA Moisture-Density Gauge Training.

h. U.S. Army Method of Instruction (40 hours).

5. Experience with Radioactive Materials:

	<u>Isotope</u>	<u>Maximum Activity</u>	<u>Duration of Experience</u>		<u>Type of Use</u>
a.	Cs-137	200 Ci	1 year	6 months	For items a-i calibration of instrumentation
b.	Cs-137	2 Ci	1 year	6 months	
c.	Co-60	50 Ci	1 year	6 months	
d.	Co-60	0.5 Ci	1 year	6 months	
e.	Sr-90	180 mCi	1 year	6 months	
f.	Cs-137	100 Ci	1 year	6 months	
g.	Pu-239	2 μ Ci	1 year	6 months	Radiography
h.	Co-60	55 mCi	1 year	6 months	
i.	Cs-137	1400 Ci	5 years		
j.	Ir-192	10 to 100 Ci	5 years		

**Robert E. Thompson, Safety Officer
Defense Intelligence Agency
Missile & Space Intelligence Center
Redstone Arsenal, AL 35898**

(256) 313-7646

1. Experience:

September 1991 to present - Defense Intelligence Agency, Missile & Space Intelligence Center, (MSIC). Serves as the Safety/Environmental Officer, also appointed as the MSIC Radiation Protection Officer (RPO). Conducts radiological surveys and leak/swipe test of foreign equipment. Responsible for the identification of radioactive material in foreign equipment. Provides instructions for the safe handling and storage of material in work areas.

Coordinates and conducts special surveys for the shipment and receipt of foreign equipment. Coordinates and transfers unwanted radioactive material to the installation storage area for final disposition. Assures the proper operation of survey equipment and coordinates calibration of all instruments used. Maintains records of surveys, leak test, inventory and other radiation protection related documents. Coordinates leak/swipe test with the installation laboratory for analysis and interpretation of results. Serves as a member of the Radiation Control Committee.

2. Specialized Training:

U.S. Army Material Command, Redstone Arsenal, AL. Radiation Safety and Health Protection December 2004, 8 hours

American Red Cross, Redstone Arsenal, AL. Standard First Aid CPR/AED training December 2004 8 hours.

U.S. Army Directorate Environmental Safety, Redstone Arsenal, Al. Resource Conservation Recovery Act (RCRA) March 2004, online, 1.5 hours.

Alabama Fire College, Redstone Arsenal, AL. Hazardous Materials Awareness and Operations May 2003, 20 hours State certified.

Alabama Fire College, Redstone Arsenal, AL. Hazardous Materials Incident Commander May 2003, 20 hours State certified.

Department of Defense Firefighter certification System, Hazardous Materials Awareness,
25 June 2003, DOD certified.

Department of Defense Firefighter Certification System, Hazardous Materials Operations
25 June 2003, DOD certified.

Department of Defense Firefighter Certification System, Hazmat Incident Commander
25 June 2003 DOD Certified.

Department of Defense, Occupational Safety & Health Group, Chemical Biological
Counter Measures Safety Training January 2002, 21 hours.

Louisiana State University, Nuclear Science Building, Selected Topics in Radiological
Engineering, 2002, 40 hours.

U.S. Army Directorate Environmental Safety, Redstone Arsenal, AL. Resource
Conservation Recovery Act (RCRA), June 2001, 24 hours.

National Fire Protection Association, Life Safety Code, June 1999, 30 hours.

Department of Labor, Evaluation Safety & Health Programs, November 1999.

Department of Labor, How to Comply with OSHA Regulations, 1997.

U.S. Army Environmental Office, Redstone Arsenal, AL. Resource Conservation
Recovery Act, 1997.

Defense Intelligence Agency, Washington, DC, Safety Officer Training, 40 hours, 1997.

Defense Intelligence Agency, Washington, DC, How to Comply With OSHA Regulations,
16 HOURS, 1996.

Consultec Scientific Inc. Radiation Safety Officer Review. Knoxville TN.
November 1995, 32 hours

U.S. Army Center for Health Prevention and Preventative Medicine, Redstone Arsenal,
AL, Laser Safety Course 16 hours. May 1995

U.S Army Chemical School, Ft. McClellan, AL. Operational Radiation Safety Course,
May 1994.

U.S. Department of Labor, Washington, DC. Personal Protective Equipment, 8 hours,
October 1994.

AMTEC Redstone Arsenal, AL, Hazardous Materials Awareness training March 1994, 8
hours.

Chem-Nuclear Systems Inc. Barnhill, South Carolina. Radioactive Waste Guidance
Course May 1994, 40 hours.

American Institute of Hazardous Materials Management, Update hazardous waste
management. April 1992, 7 hours.

University of Florida, Orlando, FL, How to Comply with OSHA Regulations, October 1992, 40 hours.

Louisiana State University, Baton Rouge, LA, Selected Topics Radiological Engineering August 1991, 40 hours.

U.S. Army Intelligence Agency, Aberdeen, MD, Radiation Protection training, December 1991, 16 hours.

3. Radioisotope Handling Experience:

DIA/AIA MSIC			
ISOTOPE	DESCRIPTION	DURATION	TYPE
Th-232	Microcuries Amounts	13 Years	Surveys/Leak Test
Ra-226	Microcuries Amounts	13 Years	Surveys/Leak Test
U-238	Microcuries Amounts	13 Years	Surveys/Leak Test
Pu-239	Microcuries Amounts	13 Years	Surveys/Leak Test
Tritium	Microcuries Amounts	13 Years	Surveys/Leak Test
Strontium	Microcuries Amounts	13 Years	Surveys/Leak Test

Item 7.3

Radiation Control Committee

Radioactive materials are to be used by or under the direct supervision of individuals designated by the RCC. The RCC has been appointed on orders by DIA, MSIC.

The RCC is responsible for broad review and oversight functions as well as making recommendations to the DIA, MSIC on all matters concerning the radiation safety program. The RCC is chaired by DIA, MSIC Chief, Program Operations. Other knowledgeable individuals, as well as representatives of organizations that either use or control ionizing radiation, are members of the RCC. The following list indicates specific membership:

- a. Chairperson, DIA, MSIC Chief of the Office for Integrated Intelligence
- b. DIA, MSIC Technical Director
- c. DIA, MSIC Chief of Infrastructure and Security Division
- d. DIA, MSIC Chief of the Foreign Materiel Division
- e. DIA, MSIC Team Leader, Foreign Materiel Division
- f. DIA, MSIC Radiation Safety Officer/Safety Officer
- g. AMCOM Radiation Safety Officer
- h. Other persons as deemed necessary.

The RCC is committed to reducing personnel exposures to ionizing radiation and as such reviews personnel exposure as provided by the DIA, MSIC RSO/Safety Officer on a quarterly basis. Means to reduce prevailing exposure are constantly being sought so that levels are kept As Low As Reasonably Achievable (ALARA).

Periodic audits of the Radiation Safety Program may be conducted by the Inspector General, Internal Review, and/or Health Services Command. The results are presented to the RCC and the DIA, MSIC.

The RCC will:

- a. Recommend policies on the safe use, handling, storage, transport, receipt, shipment, and disposal of sources of ionizing radiation.

- b. Review the radiation safety aspects of proposals for the procurement and use of sources of radiation, modifications to existing operations, radiological permit applications, and operating procedures. Review may be performed by the RSO and

Chairman for the committee

c. Review applications for all NRC licenses submitted by DIA, MSIC; monitor programs, as necessary, to ensure compliance with applicable regulations; and assure that radiological operations and activities do not endanger personnel, facilities, or the environment for which the DIA, MSIC is responsible. Review may be performed by the DIA, MSIC RSO and Chairperson for the committee.

d. Review and approve the qualifications of other agencies desiring use of items containing licensed material.

e. Review reports of accidents and incidents involving radiation to determine the cause, and recommend appropriate action to the DIA, MSIC.

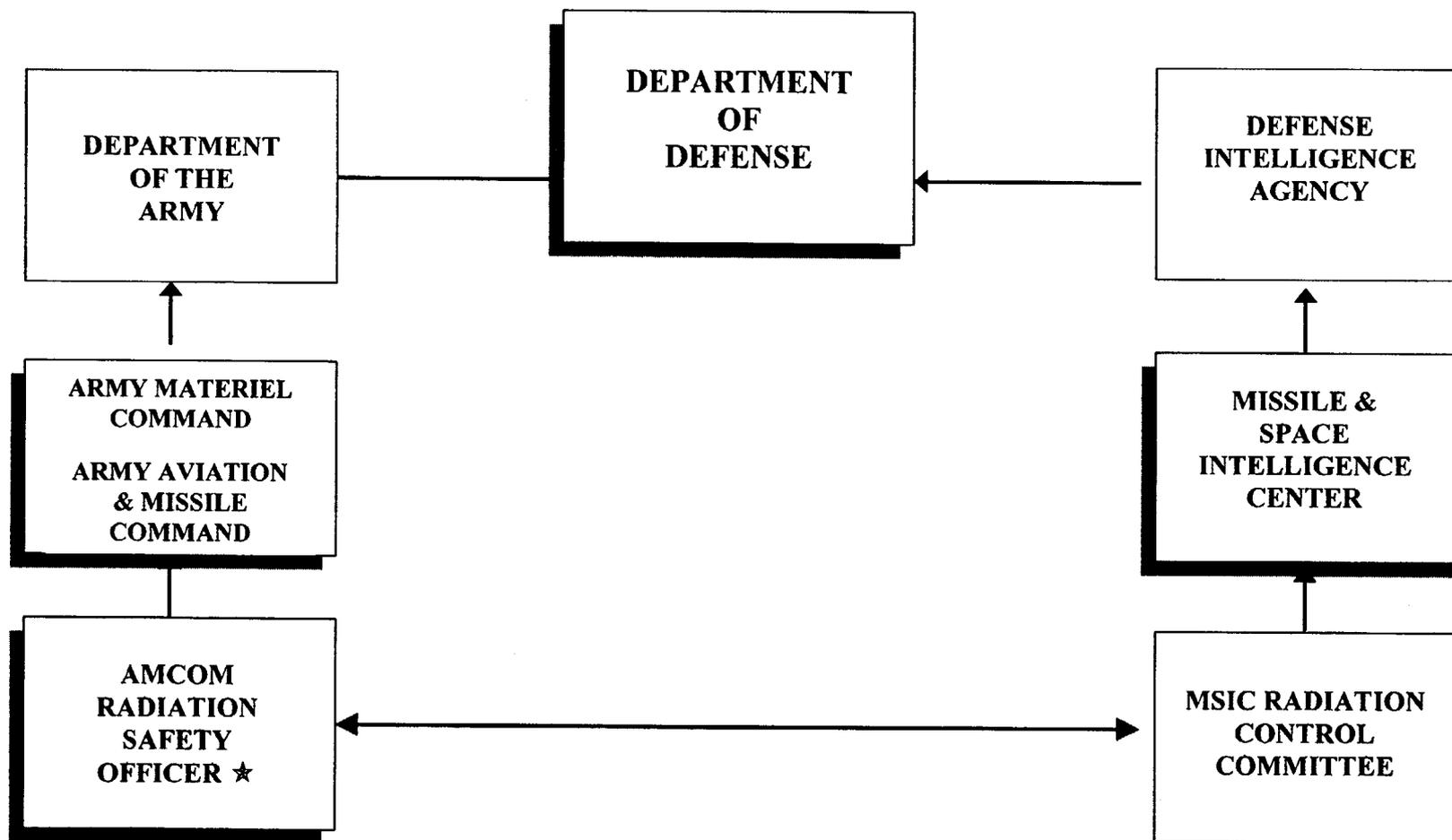
f. Meet at least semiannually or as called by the Chairperson. Minutes of the meeting will be maintained. At least three committee members shall constitute a quorum empowered to act for the full committee. These members will be the Chairperson or Alternate, the DIA, MSIC RSO or alternate, and an appointed representative from DIA, MSIC or his alternate.

Item 7.4

Organizational Chart

The relationship between the DIA, MSIC and AMCOM is illustrated by the organizational chart provided.

ORGANIZATIONAL RELATIONSHIP BETWEEN DIA MSIC AND US ARMY AVIATION & MISSILE COMMAND



★ Appointed as MSIC/DIA Radiation Safety Officer

Radiation safety support is provided to MSIC by AMCOM through Support Agreement W31G3H-04337-545. This agreement outlines the requirements of MSIC and delineates the operating relationships between MSIC and AMCOM to include Radiation Safety Program support.

**SUPPLEMENT 8.0
(NRC Form 313, Item 8)**

**TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED
AREAS**

Radiation Worker Training

Radiation Safety training will be given to personnel prior to their working in or frequenting a radiation restricted area. A record of this training will be maintained by the RSO IAW AR 40-5. This training will cover, as a minimum, the following topics:

- a. The hazards associated with radioactive materials and other sources of ionizing radiation.
- b. Basic radiation protection methods and the precautions or procedures to minimize radiation exposure and control radioactive contamination.
- c. Proper use of protective equipment and devices.
- d. Radiation sources present and methods of identification.
- e. The applicable Federal regulations and provisions of NRC licenses and DA Radiation Authorizations applying to use of ionizing radiation producing equipment or material.
- f. The right of employees to request reports of their exposure to ionizing radiation under the provisions of 10 CFR 19.
- g. Procedures to be followed in the event of an accident/incident or other emergency situation.

Specialized Training

Individuals responsible for surveying radioactive materials and/or storing components, parts and/or devices containing radioactive materials will be provided additional training covering radiation surveys, wipe testing, and the handling, storage and shipment of radioactive materials.

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:

a. 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 written for hazardous operations.

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

c. Where possible, demonstrate how the operations are performed.

d. Allow employee to practice the steps and constructively criticize the employee's performance.

e. Periodically spot check employee's safety practices during job performance.

f. Allow employee to perform unfamiliar operations with material that is not radioactive before attempting the same operation involving materials with ionizing radiation.

g. Periodically bring employee's training up to date on the latest developments concerning relevant information, procedures, changes, and safety techniques.

SUPPLEMENT 9.0
Facilities and Equipment

Radioactive material will be stored in secured facilities with access limited to those having official business. Storage locations will be properly posted in accordance with NRC requirements. A typical location would consist of a locked warehouse or similar structure or laboratory located in an area restricted to the public and guarded against unwarranted entry.

Temporary or permanent shielding will be employed to prevent excessive exposure when time and distance factors alone would not be adequate. Shielding will also be used whenever feasible to minimize exposure. Sealed sources in commodities or test items will not be removed from the device without prior written approval of the RCC.

Storage facility requirements will be determined by using NBS Handbook 92 as a guide. Radioisotope storage shall be secured against unauthorized entry and removal of items in storage. Storage and use locations will be approved the RCC. Radioactive items in excess of needs will be held and disposition made in accordance with AR 11-9 and applicable Federal, State and Army requirements.

A listing of available instrumentation is provided below. Instruments will be replaced when obsolete or non-repairable with a similar item. Review of instrument requirements will be made by the RCC when necessary. The calibration of radiation detection instrumentation is performed by the U.S. Army Test, Measurement and Diagnostic Equipment Group as part of the Army calibration program. Intervals for the calibration of instrumentation are established as part of this program and controlled by the use of a computer recall system.

RADIATION MONITORING EQUIPMENT AVAILABLE AT DIA, MSIC

Manufacturer	Model	Number Available	Radiation Detected
Eberline	ASP-1	1	Alpha
Victoreen	190	1	Alpha/Beta/Gamma
Exploranium	135	1	Alpha/Beta/Gamma

RADIATION MONITORING EQUIPMENT AVAILABLE AT AMCOM SAFETY OFFICE

Manufacturer	Model	Number Available	Radiation Detected
Ludlum 19	Micro-R	5	Gamma
Eberline	E 520	2	Beta/Gamma
Eberline	E 600	1	Beta/Gamma
Eberline	ASP-1	2	Alpha
Eberline	RO 20	2	Beta/Gamma
Staplex	Hi-Vol Air Sampler	2	Beta/Gamma
Aptec-NRC, Inc.	SM-400A	6	Beta/Gamma
Victoreen	450-P	1	Gamma
Victoreen/Inovision	451-B	4	Gamma
Exploranium	135	1	Alpha/Beta/Gamma

**SUPPLEMENT 10.0
(NRC Form 313, Item)**

Radiation Safety Program

- Item 10.1 Procedures for Surveying Foreign Materiel
- Item 10.2 Personnel Monitoring Requirements
- Item 10.3 Radioactive Contamination Guides
- Item 10.4 AMCOMR 11-1 AMCOM Radiation Safety Program
- Item 10.5 AR 11-9, The Army Radiation Safety Program
- Item 10.6 AR 40-5, Chapter 9, Preventive Medicine
- Item 10.7 Joint Army Pamphlet 40-18, Personnel Dosimetry Guidance and Dose
Recording Procedures for Personnel Occupationally Exposed to Ionizing
Radiation

**** These documents may be revised and updated to conform to Federal, State and Army regulations without prior notification of NRC staff as approved by the DIA, MSIC RCC and RSO.**

Item 10.1

Procedures for Surveying of Foreign Material

The following procedures will be followed at the Port of Entry or as soon as practical thereafter for foreign material:

a. Prior to arrival of the FM, DIA, MSIC will coordinate with the DIA, MSIC RSO to conduct a radiological sweep of the material at the Port of Entry, or as soon as possible thereafter.

b. The Foreign Material Project Manager, with the assistance of the Technical Project Manager, will, to the greatest extent possible, determine the onboard radiological equipment and provide this information to the DIA, MSIC RSO prior to receipt.

c. Upon arrival of the FM, on-site personnel will check crew and driver compartments for the presence of radioactive warning labels, NBC detectors/meters/warning devices and broken instrument dials. If any of the above items are located, the DIA, MSIC RSO will be notified immediately.

d. Personnel conducting the radiological sweep will wear protective clothing as directed by the DIA, MSIC RSO.

e. Personnel will wear disposable gloves at all times while handling radioactive materials.

f. Before leaving the area, the hands will be monitored.

g. Personnel will not eat, drink, smoke or apply cosmetics in any area where radioactive material is stored or used.

h. Personnel will not store food, drink, or personal effects in areas where radioactive material is stored or used.

i. Personnel will wear monitoring devices when directed by the DIA, MSIC RSO.

Item 10.2

Bioassay and Personnel Monitoring

Sources are expected to be well below the activity limits given in the NRC Regulatory Guides and Regulations for conducting bioassay of workers. In the event a source is above the limits of NRC guidelines for Bioassay Requirements for Tritium, an operational plan will be prepared to include bioassay and monitoring requirements. The plan will be presented to the RCC for approval before operations begin. All responsibilities and procedures for personnel monitoring are prescribed in AR 11-9, Joint Army Pamphlet 40-18 and AMCOMR 11-1.

Item 10.3
Contamination Guide

Table 5-2.
Surface Radioactivity Values in dpm/100 cm²

Nuclide ^a	Removable ^{b, c}	Total (Fixed + Remov- able ^{b, d})
^{nat} U, ²³⁵ U, ²³⁸ U, and associated decay products	1,000	5,000
Transuranics ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I	20	500
^{nat} Th, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³¹ I, ¹³³ I	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and others noted above ^e	1,000	5,000
Tritium and tritiated compounds ^f	10,000	NA

- a. See para 5-3 for applicability of this table. This table is extracted from 10 CFR 835, appendix D. The values in this table apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, apply the limits established for alpha- and beta-gamma-emitting nuclides independently.
- b. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
- c. The amount of removable radioactive material per 100 cm² of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note: The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and ²²⁶Ra, ²²⁷Ac, ²²⁸Th, ²³⁰Th, ²³¹Pa and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.
- d. The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm² is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide G if: (1) From measurements of a representative number n of sections it is determined that $\frac{1}{n} \sum_{i=1}^n S_i \geq 3G$, where $S_i \geq G$ is the dpm/100 cm² determined from measurement of section i ; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm² area exceeds 3G.
- e. This category of radionuclides includes mixed fission products, including the ⁹⁰Sr which is present in them. It does not apply to ⁹⁰Sr which has been separated from the other fission products or mixtures where the ⁹⁰Sr has been enriched.
- f. Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface radioactivity value provided in this table is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore a "Total" value does not apply.

Item 10.4

AMCOMR 11-1

Radiation Safety Program

**AMCOM
Regulation 11-1**

Radiation Safety

**AMCOM
Radiation Safety
Program**

**Headquarters
US Army Aviation and Missile Command
Redstone Arsenal, AL 35898-5000
25 February 2002**

UNCLASSIFIED

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY AVIATION AND MISSILE COMMAND
Redstone Arsenal, Alabama 35898-5000

AMCOM Regulation 11-1

25 February 2002

Radiation Safety
AMCOM RADIATION SAFETY PROGRAM

FOR THE COMMANDER:

EDWARD L. STONE
COL, OD
Chief of Staff

OFFICIAL:

//s//
LINDA B. READUS
Secretary of the General Staff

HISTORY. This document was first published as MICOM Regulation 385-20. This regulation reflects the current radiation safety program and the changes in the Federal regulations.

SUMMARY. This regulation provides policy, responsibilities, and safety requirements for personnel, facilities, and systems operating under the US Army Aviation and Missile Command Radiation Safety Program. The guidance implements the US Army Aviation and Missile Command Radiation Safety Program in accordance with the US Army Aviation and Missile Command Nuclear Regulatory Commission (NRC) licenses.

APPLICABILITY. This regulation is applicable to all organizational elements within the US Army Aviation and Missile Command. The regulation is also applicable to any organization that has been authorized to use radioactive material under the management control of the US Army Aviation and Missile Command Nuclear Regulatory Commission licenses.

PROPONENT AND EXCEPTION AUTHORITY. The proponent of the regulation is the US Army Aviation and Missile Command Safety Office (AMSAM-SF-A.) Only the proponent has the authority to approve exceptions to this regulation.

AMCOMR 11-1

INTERNAL CONTROL SYSTEMS. The regulation does not contain internal control provisions as outlined in the Management Control Evaluation Process.

SUPPLEMENTATION. Further supplementation is prohibited without prior approval of AMCOM, ATTN: AMSAM-SF-A, Redstone Arsenal, AL 35898-5000.

SUGGESTED IMPROVEMENTS. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications) to Commander, US Army Aviation and Missile Command, ATTN: AMSAM-SF-A, Redstone Arsenal, AL 35898-5000.

DISTRIBUTION. This publication is approved for public release, distribution unlimited.

SUPERSESION. This regulation supersedes MICOM Regulation 385-20, 17 September 1993.

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APPENDIX E – GLOSSARY

1. PURPOSE. This regulation establishes responsibilities and procedures for the use of, licensing, control, storage and inventory, transportation, handling and disposal of radioactive materials and ionizing and nonionizing radiation sources.

2. REFERENCES. Required and related publications are listed in Appendix A.

3. EXPLANATION OF TERMS. Abbreviations and special terms used in this regulation are explained in Appendix E (Glossary.)

AMCOMR 11-1

4. POLICIES.

a. Radioactive sources and radiation-producing devices will be used only when it is determined they are necessary for the accomplishment of the assigned mission and practical substitutes do not exist.

b. Radiation Safety Programs will be established by each organization or activity to ensure adequate facilities, equipment, procedures, controls, and training are commensurate with the radioactive material or radiation-producing device used. These programs will be consistent with Federal, DA, and AMC regulations and directives and will ensure that exposures to ionizing radiation are maintained As Low As Reasonably Achievable (ALARA). Under the provisions of this regulation, the ALARA concept will be implemented by guidelines, written procedures, review and maintenance of program records, and a periodic review of the performance of the program as is specifically outlined in Title 10 Code of Federal Regulations (CFR) Part 20.

c. Government-owned, contractor-operated (GOCO) operations and contractors utilizing or possessing radioactive material or radiation-producing devices will maintain Radiation Safety Programs and/or policies consistent with this regulation as allowed by existing contract between the US Government and the installation contractor. This regulation in no way obligates the US Government for any liability to contractor personnel for any adverse health effects.

5. RESPONSIBILITIES.

a. Commander, US Army Aviation and Missile Command, will:

(1) Ensure adequate resources exist to maintain a formal Radiation Safety Program as required by Federal and Army regulations and directives.

(2) Ensure exposures to ionizing radiation are maintained as low as reasonably achievable (ALARA) and within current accepted radiation protection standards, laws, and regulations.

b. Tenant Commanders/Directors using radioactive materials or radiation-producing devices will:

(1) Develop and implement a Radiation Safety Program in accordance with applicable Federal and Army regulations and directives. Those programs operating independently of the AMCOM program as outlined and agreed to by Memorandum of Understanding (MOU) will assume responsibility for their programs. This agreement, however, does not relieve them of the responsibilities listed in paragraphs (2), (3), (4)(c), and (4)(f) below.

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(2) Appoint, on orders, a Radiation Safety Officer (RSO) and Alternate to manage the Radiation Safety Program.

(3) Appoint, on orders, a representative to the AMCOM Radiation Safety Committee (RSC).

(4) Furnish the AMCOM Safety Office, AMSAM-SF-A, the following:

(a) Copies of NRC licenses, Army Radiation Authorizations (ARA) and Army Radiation Permits (ARP) with updates when amended or renewed for operations on Redstone Arsenal.

(b) Copies of current appointment orders for the RSO and Alternate and representative to the AMCOM RSC.

(c) Copies of annual radioactive material/radiation-producing device inventory no later than 30 September of each year. Provide updated inventories as soon as changes occur.

(d) Copies of inspection reports/program evaluations of their Radiation Safety Programs by outside activities, e.g., Nuclear Regulatory Commission (NRC) and US Army Center for Health Promotion and Preventive Medicine (CHPPM), along with copies of responses to any discrepancies noted.

(e) Plans for construction/modifications to facilities where radioactive material or radiation-producing devices are used as early as is practicable in the planning stages.

(f) Notification of accidents, incidents, injuries, overexposure of personnel, or loss of radiation sources occurring on Redstone Arsenal immediately when response by AMCOM personnel is required or within 24 hours of their occurrence if response by AMCOM personnel is not required.

(g) Copies of all operational SOPs for approval.

c. Chief, AMCOM Safety Office, will:

(1) Develop and implement a Radiation Safety Program in accordance with applicable Federal and Army regulations and directives.

(2) Appoint, on orders, an AMCOM RSO and Alternate to manage the AMCOM Radiation Safety Program, to include ionizing and nonionizing radiation protection.

(3) Appoint, on orders, an AMCOM RSC to oversee the implementation of the Radiation Safety Program.

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(4) Appoint, on orders, a Custodian of Radiation Exposure Records (Automated Dosimetry Report (ADR)) to maintain and provide oversight to the radiation dosimetry program at AMCOM.

(5) Appoint, on orders, an AMCOM Safety Office representative to the AMCOM RSC.

(6) Serve as Chairperson of the AMCOM RSC, calling and presiding at yearly and special meetings.

(7) Ensure that adequate resources, equipment, and facilities are available to support the Radiation Safety Program.

(8) Provide policy guidance for review and evaluation of the use of radioactive materials in AMCOM systems to ensure procurement contracts adequately identify radioactive material, adequate NRC licensing and ARAs are obtained, and adequate warnings and instructions are provided in systems operational manuals and on equipment, where appropriate.

d. The AMCOM Radiation Safety Officer will:

(1) Implement and administer the AMCOM Radiation Safety Program.

(2) Advise the Commander, AMCOM, and RSC on the status of compliance with NRC licenses, ARAs, and ARPs.

(3) Provide technical guidance and assistance to ensure compliance with Federal and DA regulations and directives.

(4) Perform or cause to be performed, radiation surveys as required by NRC license, ARAs, ARPs, Federal and Army regulations, and directives.

(5) Ensure the proper issuance, usage, and evaluation of personnel dosimetry to monitor radiation exposures.

(6) Maintain copies of all NRC licenses, ARAs, and ARPs covering the possession, use, or storage of ionizing radiation sources on Redstone Arsenal.

(7) Ensure radiation workers receive radiation safety training commensurate with the hazards experienced in the work place.

(8) Maintain an inventory of radioactive material and radiation-producing devices at Redstone Arsenal. Obtain copies of tenant and contractor activities inventories and

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provide to AMCOM Security, Fire Department, and other appropriate AMCOM offices/directorates.

(9) Provide staff review and concurrence on local regulations, SOPs, and policies relating to radiation safety.

(10) Ensure radiation protection records are maintained in accordance with appropriate Federal, Army, and AMCOM regulations.

(11) Ensure accidents, incidents, injuries involving radiation (ionizing or nonionizing), overexposure of personnel, and loss of radiation sources are investigated, evaluated, documented, and reported in accordance with Federal, Army, AMC, and local regulations.

(12) Coordinate and prepare AMCOM applications, renewals, and amendments to NRC licenses and ARAs. Provide guidance and review in preparation and submission of contractor requests for ARPs.

(13) Ensure radioactive material movement, shipments, and receipt functions are conducted in accordance with Federal, Army, and AMCOM regulations.

(14) Coordinate the consolidation of radioactive waste disposal at Redstone Arsenal. Provide guidance to waste generators concerning packaging for storage pending disposal. Request disposal instructions from the Chief, Army Low Level Radioactive Waste Disposal Division, US Army Operations Support Command, Rock Island, IL.

(15) Provide annual report of radiation exposures to individual radiation workers.

(16) Provide information regarding the prenatal exposure risks and concerns to the developing embryo or fetus to females occupationally exposed to ionizing radiation (NRC Regulatory Guide 8.13).

(17) Serve as member of AMCOM RSC and representative to tenant RSCs as appropriate.

(18) Provide Radiation Safety Program support to tenant activities without health physics staff.

(19) Provide concurrence to Foreign Military Sales cases identifying radioactive material.

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(20) Maintain authority to order suspension of any activity involving radiation or radioactive material believed to be a potential threat to the health or safety of AMCOM personnel or property.

(21) Review and approve in writing the selection of each local Laser Safety Officer (LSO) as required.

(22) Monitor all AMCOM laser operations and provide guidance in matters pertaining to laser safety.

(23) Conduct periodic evaluations of laser safety programs to ensure compliance with regulations and SOPs.

e. The Alternate AMCOM Radiation Safety Officer will:

(1) Assist the RSO to ensure the safe conduct of radiation operations and compliance with this regulation.

(2) Perform the duties of the RSO in his absence or nonavailability.

(3) Serve as a member of the AMCOM RSC.

f. The AMCOM Radiation Safety Committee will:

(1) Consist of the following members and their alternates:

(a) Chairperson, Chief, AMCOM Safety Office.

(b) AMCOM Radiation Safety Officer.

(c) AMCOM Alternate Radiation Safety Officer.

(d) AMCOM Safety Office representative.

(e) Medical Department representative.

(f) Representative from each AMCOM activity using ionizing and nonionizing radiation sources.

(g) Radiation Safety Officers from the tenant activities having a Radiation Safety Program.

(h) AMCOM Environmental Office representative.

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- (i) GOCO and civilian contractor representatives.
- (j) Other persons as deemed necessary.

(2) Act as an advisory committee for the Commander, AMCOM, concerning all matters pertaining to the AMCOM Radiation Safety Program. Personnel appointed to the committee shall be knowledgeable, either through training or experience, in the safe use of radioactive materials and radiation-producing devices (ionizing and nonionizing).

(3) Perform the following duties:

(a) Recommend to the Commander, AMCOM, policies on the safe use, handling, storage, transport, receipt, shipment, and disposal of sources of ionizing and non-ionizing radiation.

(b) Review applications for all NRC licenses, ARAs, and ARPs submitted by AMCOM, tenant activities and contractors. Monitor programs, as necessary, to ensure compliance with applicable regulations. Ensure radiological operations and activities of tenant activities and contractors do not endanger personnel, facilities, or the environment for which the Commander, AMCOM is responsible. The RSO and Chairperson may perform review for the committee.

(c) Review the radiation safety aspects of proposals for the procurement and use of sources of radiation, to include modifications to existing radiological operations, radiological permit applications, and operating procedures. The RSO and Chairperson may perform review for the committee.

(5) Meet at least once each calendar year and as called by the Chairman. Minutes of the meetings will be provided to the Chief of Staff, AMCOM, for review and will be maintained in accordance with AR 25-400-2. At least three committee members shall constitute a quorum empowered to act for the full committee. These members will be the Chairperson, or Alternate, the AMCOM RSO, and an AMCOM Safety Office member.

g. AMCOM radiation safety supervisors will:

(1) Prepare and implement Standing Operating Procedures (SOPs) for all operations that use radioactive material or radiation-producing devices.

(2) Enforce the provisions of this regulation, SOPs and special precautions applicable to their operations.

(3) Ensure personnel working with radiation wear appropriate dosimetry devices to monitor radiation exposure when deemed necessary.

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- (4) Ensure personnel working with radioactive material or radiation producing devices receive required training before any potential exposure.
- (5) Maintain a current inventory of all radioactive materials and radiation devices used within their area.
- (6) Secure all radioactive materials and sources of radiation against loss or unauthorized use.
- (7) Not allow personnel to eat, drink, smoke, chew tobacco or gum, or apply cosmetics in an area where radioactive materials are used or stored.
- (8) Notify the AMCOM RSO immediately in the event of an accident, incident, injury involving radiation, overexposure of personnel, or loss of a radiation source.
- (9) Ensure transients in radiation areas comply with applicable requirements of this regulation and SOPs and are aware of the potential hazard to which they may be exposed.
- (10) Ensure radiation detection instrumentation used is properly maintained and calibrated in accordance with NRC, DA, and AMC regulations and directives.

h. AMCOM radiation workers will:

- (1) Know and comply with the requirements of this regulation, SOPs, and special instructions, written or verbal, applicable to their work with radioactive material or radiation-producing devices.
- (2) Wear the appropriate dosimetry device(s) (thermoluminescent dosimeter (TLD), pocket dosimeter) and report promptly, in writing, circumstances incident to the loss of a TLD device to their supervisor and the AMCOM RSO.
- (3) Not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in an area where radioactive materials are used or stored.
- (4) Immediately report to their supervisor any discrepancies in radiation safety procedures, accidents, incidents involving radiation, cases of suspected overexposure, or loss of radiation sources.
- (5) Prevent the spread of contamination by the use of protective clothing, such as gloves, where appropriate.

i. The AMCOM Environmental Coordinator will:

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(1) Provide guidance in the development of environmental documentation in support of the use of radioactive material.

(2) Provide a representative to the AMCOM RSC.

j. Commander, US Army Medical Activity (MEDDAC), will:

(1) Maintain capability to provide on-site radiation safety support following radioactive material contamination accidents and incidents.

(2) Provide medical care for all Army personnel who are injured due to overexposure to ionizing or nonionizing radiation.

(3) Provide a representative to the AMCOM RSC.

k. Director, Security Assistance Management Directorate, will:

(1) Request assistance from the AMCOM RSO in the identification of items containing radioactive material offered for foreign military sales.

(2) Provide Foreign Military sales (FMS) cases offering radioactive material to the AMCOM RSO for review and concurrence.

l. AMCOM Contracting Officers will: Notify the AMCOM RSO before processing acquisitions of items containing radioactive material or devices capable of producing radiation.

m. Project/Systems offices will:

(1) Coordinate plans for the use of radioactive material with the AMCOM Safety Office/RSO and initiate action for securing the appropriate NRC license or ARA.

(2) Ensure specifications and drawings for radioactive commodities and components comply with 10 CFR Part 20.1901, 1904, 1905 for marking and labeling requirements and quality assurance provisions specified in current NRC licenses where applicable.

(3) Ensure all contracts and leases contain the requirement to restore installation property to NRC criteria for unrestricted use.

n. Acquisition Center and Research, Development and Engineering Center (RDEC) Contracting Offices will:

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(1) Ensure the appropriate Federal Acquisition Regulation (FAR) and Defense Acquisition Regulation (DAR) clauses and requirements are included in all contracts.

(2) Ensure appropriate NRC licenses or ARAs have been obtained prior to contract award.

o. Integrated Materiel Management Center (IMMC) will:

(1) Coordinate supply management actions as necessary to ensure the same national stock numbers will not apply to radioactive and nonradioactive items in the Federal Supply System, or to radioactive items having the same functional task but possessing different radionuclides.

(2) Establish and maintain appropriate data to identify applicable items as radioactive. Incorporate radioactive identification data, such as Special Control Item and Demilitarization codes, with item management data and disseminate through the supply cataloging system.

(3) Issue instructions for maintenance, rebuild, rework, demilitarization and disposal of unwanted radioactive items of issue.

(4) Ensure adherence to 10 CFR Part 20.1901,1904,1905 for marking and labeling requirements in changes to specifications and drawings for radioactive commodities and components.

(5) Maintain accountability of AMCOM managed radioactive items of issue to include annual inventories to ensure that possession limits prescribed by NRC license and ARAs are not exceeded in CONUS supply.

(6) Ensure specific instructions, procedures, and warnings on handling, storing, and disposal of radioactive commodities are incorporated into technical publications and other appropriate publications.

6. IONIZING RADIATION PROCEDURES.

a. Use:

(1) Operations that have been approved to use and possess radioactive material or radiation-producing devices under an AMCOM NRC License, an ARA (Army Radiation Authorization), or an ARP (Army Radiation Permit) will comply with all conditions of the appropriate license, authorization, or permit, as appropriate.

(2) Refer to AR 11-9, The Army Radiation Safety Program (28 May 1999), Chapters 2-2, 2-3 and 2-4, for specific instructions on NRC licenses, ARAs, and ARPs.

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b. Receipt, Shipment, Transfer and Turn-In of Radioactive Material and Radioactive Waste:

(1) The AMCOM RSO or his designee will maintain supervisory control for monitoring radioactive material packages IAW Department of Transportation (DOT), NRC and other appropriate regulations and directives.

(2) The Director of Logistics, Redstone Arsenal Support Activity (RASA) will notify the AMCOM RSO in advance of anticipated shipments and receipts of radioactive material.

(3) Incoming radioactive material/devices will be checked for damage prior to storage or use. Damaged and/or leaking shipments will be reported to the AMCOM RSO. Individuals receiving radioactive packages will contact the AMCOM RSO for instructions when the package is to be opened. The AMCOM RSO or his designee will:

(a) Conduct a radiation survey and wipe test on the package as appropriate.

(b) Complete a radioactive material receipt document.

(4) Those activities having dedicated RSOs, i.e., US Army Test Measurement and Diagnostic Equipment Activity, Defense Logistics Agency, Missile and Space Intelligence Center, will be notified for specific guidance for disposition of packages.

(5) A Radioactive Material Movement Form completed by the AMCOM RSO or his designee will normally accompany a shipment of radioactive material. This form will contain radiation survey information, packaging and labeling instructions, and will be part of the shipping record.

(6) A Radioactive Material Movement Form completed by the AMCOM RSO or his designee will accompany turn-in of radioactive material and radioactive waste. The AMCOM RSO or his designee will inspect all radioactive material and radioactive waste and provide specific handling and/or packaging instructions as appropriate.

(7) On-post movement of radioactive material will normally be accomplished by government vehicle. The radiation dose rate will be less than 2 milliroentgen per hour in any occupied area of a vehicle.

(8) Unless prohibited by an NRC license, radioactive material may be moved in packages not approved by DOT if the move is within installation boundaries and under the immediate supervision of the AMCOM RSO or his designee.

(9) The Defense Reutilization and Marketing Office (DRMO) will be surveyed quarterly by the AMCOM RSO or his designee.

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c. Radioactive Waste.

(1) A central storage and collection area will be designated for radioactive waste. This area should be selected to minimize the risk to personnel and property. The AMCOM RSO will approve the collection area and waste container.

(2) The use of radioactive material shall be well planned and efforts taken to generate a minimum of radioactive waste.

(3) The selection of a waste collection container should be based upon the rate the waste is generated in the work area and should be no larger than what would accumulate in a reasonable collection period. The collection period will be determined by usage/generation rates to limit the amount of waste stored in the work area. Containers should be painted yellow, have a magenta or black radiation tre-foil symbol () and be marked "Caution: Radioactive Material."

(4) The contents of the waste collection container must be identified by isotope, level of radioactivity, and date measurements were taken. This information shall be recorded as the waste is deposited in the collection container, both on the item or package of waste and a log or list of the contents of the container. This monitoring is in addition to the container and storage area monitoring.

(5) Areas where radioactive waste collection containers are stored should be monitored periodically for radiation levels, outside surface area contamination and container integrity.

(6) As the waste collection container is filled near its capacity, a request for turn-in should be initiated and the AMCOM RSO or his designee contacted for inspection of the contents and container. Instructions for the movement of the container will be provided at that time.

(7) Radioactive waste will be collected and consolidated at a central storage location at AMCOM. The AMCOM RSO will coordinate the disposal and requests for disposal instructions through the US Army Operation Support Command, Rock Island, IL.

d. Surveys and Leak Tests:

(1) The AMCOM RSO or his designee will conduct routine surveys of radiation operations under representative conditions.

(2) Surveys will be performed using an "ACTIVE" survey meter, leak/swipe testing and/or air sampling, as appropriate, to assess radiation and contamination levels. Survey instruments will be calibrated in accordance with TB 43-180.

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(3) Leak tests on sealed radioactive sources will be conducted annually or semi-annually as required by NRC licensing, or federal regulations if there is no applicable NRC license.

(4) Leaking sources will be removed from use and be subject to repair or disposal. Leaking sources will be double-bagged and placed in an appropriate storage location until repair or disposal can be accomplished. Contamination of 0.005 microcuries or more will be considered evidence of a leaking source. The AMCOM RSO will take appropriate action concerning notification of the NRC, if required.

e. Reporting Noncompliance/Safety Defects under 10 CFR 21.

(1) The provisions of 10 CFR 21 will be followed by all NRC licenses activities in defining and reporting noncompliance with NRC requirements and safety defects. 10 CFR 21 applies to the following:

(a) NRC Byproduct Material Licenses.

(b) NRC Source Material Licenses.

(c) NRC Special Nuclear Material Licenses.

(d) Organizations authorized by specific licenses to package and offer to carrier licensed radioactive material for transport.

(e) Elements that receive, store, use, distribute, or dispose of radioactive commodities authorized by another organization's specific NRC license.

(f) Activities involved in contracting for NRC licensed commodities or suppliers of safety-related parts, services, or consultation for NRC licenses activities.

(g) Organizations that evaluate radiation safety defects, hazards, or noncompliance.

(2) The determination of whether a substantial safety hazard exists will be based on an evaluation using the criteria in NUREG-0303 (Rev 1) and coordination with the AMCOM RSO and the NRC license manager where appropriate. A substantial safety hazard means the loss of safety function to the extent that there is a major reduction in the degree of protection provided to public health and safety for any licensed facility or activity. The term "public health and safety" includes both members of the public as well as license worker/employees. This hazard may present itself in the form of a defect, deviation, or condition of noncompliance.

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(3) Contracts for NRC licensed materials or for safety-related services, hardware or consultation will contain the statement that 10 CFR 21 applies to alert the contractors to their responsibilities.

(4) The following items will be posted in a conspicuous location in the work area where NRC licensed material is used.

(a) Copies of 10 CFR 19, 10 CFR 20, and 10 CFR 21.

(b) NRC Form 3.

(c) The Energy Reorganization Act of 1974, Section 206.

(d) Written procedures containing notification procedures implementing the requirements of this section.

(e) If posting the documents indicated in 4(a) and 4(d) above is not practical, a notice may be posted indicating where these documents may be reviewed.

(5) A suspected defect or noncompliance to 10 CFR 21 must be promptly evaluated to determine if a substantial safety hazard exists. The following reporting procedures are to be followed:

(a) The individual who discovers a defect or becomes aware of a condition of non-compliance involving NRC licensed material will immediately notify his immediate supervisor, or, in the supervisor's absence, his next line supervisor.

(b) The supervisor receiving the notification of the defect, deviation, or condition of noncompliance will immediately provide the following information to the AMCOM RSO:

(1) Name, organization, and phone number of the individual who made the initial report.

(2) The nature of the defect, deviation, or condition of noncompliance.

(3) The date and time the defect, deviation, or condition of noncompliance was identified.

(4) The nature of the operation being conducted at the time of the defect, deviation, or condition of noncompliance was identified.

(5) Any action taken to correct the defect, deviation or condition of noncompliance

(6) Any suspected or actual exposure of personnel to excess levels of radiation.

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(7) The AMCOM RSO will request any additional information deemed necessary and will provide the Commander, AMCOM, with all data needed for analysis of the potential for a substantial safety hazard and submission of a report in accordance with 10 CFR 21. A report will be submitted within two days of the determination that 10 CFR 21 applies to the Regional Office of Inspection and Enforcement, NRC, as listed in 10 CFR 20. AMCOM users of items licensed to other MACOMs will immediately report 10 CFR 21 issues to the AMCOM RSO for evaluation and potential notification to the licensee, who will initiate reporting to the NRC.

f. Emergency Procedures.

(1) Radiation incidents/accidents as defined by AR 385-10 and AR 385-40 will be reported to the AMCOM RSO and followed by the appropriate investigation and reporting procedures.

(2) The following will apply to any event where a radioactive source is damaged or is suspected of leaking:

(a) Evacuate all personnel not directly involved in control of contamination and clean up of the area.

(b) Turn off all radiation producing devices and ventilation equipment if airborne contamination is known or suspected.

(c) Secure the area to prevent unauthorized entry.

(d) Contact the AMCOM RSO and emergency response personnel immediately.

(e) Personnel with minor wounds will be decontaminated prior to leaving the controlled area. In the event the individual must be transported immediately for medical treatment, the person will be accompanied by the AMCOM RSO or other designated individual to provide continued monitoring and decontamination.

(f) Decontamination of personnel and property will be accomplished under the supervision of the AMCOM RSO or other designated individual prior to release in accordance with current established permissible contamination limits.

(3) In the event of a fire or explosion, paragraph (2)(a) through (f) applies in addition to the following:

(a) Personnel at the scene will be moved up wind from the source taking all necessary precautions to avoid exposure to potential airborne contaminants.

(b) If possible, remove all radioactive sources and devices from the area.

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(4) Exposure of Personnel.

(a) The AMCOM RSO will be notified immediately of any known or suspected overexposure, either external or internal, that is in excess of current radiation exposure criteria. The AMCOM RSO will investigate reports of overexposure and the individual referred to the appropriate medical facility for evaluation.

(b) Any known ingestion, inhalation, or absorption of radioactive materials will be treated as an emergency. The MEDDAC will be notified for immediate investigation of the incident. Radiological first aid will be administered as necessary. Arrangement for bioassay will be made by the MEDDAC in consultation with the AMCOM RSO. Upon evaluation, the AMCOM RSO will provide consultative services to medical personnel.

(c) Clinical management of overexposures will be the responsibility of the MEDDAC. The AMCOM RSO will provide consultative services to medical personnel.

g. Industrial X-Ray Facilities.

(1) Industrial radiation operations will not be installed or modified without prior approval of the AMCOM RSC. Requests for approval of proposed facilities or modifications to existing facilities will be provided to the AMCOM RSO and include the following:

(a) Location and proposed facility drawings showing wall thickness, construction materials, etc.

(b) Tube voltage and current of equipment.

(c) Projected workload, i.e., number of exposures per week, exposure duration and number and type of people (occupational radiation workers, office workers, etc.) potentially exposed to the x-rays.

(d) Interim standing operating procedures.

(e) Data required for new radiation workers.

(f) Qualifications of each person who will operate or supervise the operation of the x-ray equipment.

(g) Any further information deemed necessary by the AMCOM RSO.

(2) Proposals for new or modified facilities will be reviewed by the AMCOM RSC and provided to the appropriate authorities for review and approval as required by

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AMCR 385-100. Approval must be obtained prior to commencing construction or modification.

(3) Industrial x-ray facilities will be classified and governed by procedures and conditions of the facility's NRC license, ARA, and NBS Handbook 107, 111 or applicable ANSI standards as appropriate.

(4) Radiation protection surveys by a qualified expert must be performed on all new or modified facilities before being placed into operation. Operating supervisors will notify the AMCOM RSO to coordinate scheduling of the survey.

(5) Surveys of permanent industrial facilities should be performed in the initial activation of the facility, any time there is a change or modification of x-ray producing equipment. Operation surveys will be performed on a monthly basis. Radiation surveys of nonpermanent field operations will be performed at each new field setup.

(6) Operations will not be conducted if radiological safety devices are not functioning.

(7) All radiation workers and transients, where appropriate, will wear personnel monitoring devices.

(8) Supervisors will ensure personnel do not receive radiation exposures in excess of the applicable standards. Overexposures will be reported to the AMCOM RSO.

(9) An approved SOP covering all phases of the operation will be available and all personnel will be familiar with its contents.

(10) X-rays may also be a potential hazard where operating voltages may exceed 15,000 volts on some equipment not intentionally designed or adequately shielded for that purpose. All such equipment should be identified to the AMCOM RSO for evaluation.

h. Personnel Monitoring and Dosimetry Records.

(1) Occupational exposure to radiation will be maintained as low as reasonably achievable (ALARA) in accordance with NRC Regulatory Guide 8.10.

(2) An appropriate personnel monitoring device will be used in accordance with DA PAM 40-18 to monitor the exposure of each individual who is occupationally exposed to sources of ionizing radiation or who receives an accumulated dose equivalent of radiation in excess of five percent (5%) of the applicable basic radiation protection standard.

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(3) Bioassay will be used to monitor internal exposures when the potential exists for exposure to radiation from inhalation, ingestion, or absorption through the skin.

(4) The following dosimetry devices are currently used at AMCOM:

(a) Thermoluminescent dosimeter (TLD), whole body, wrist and ring.

(b) Pocket dosimeter (self-reading).

(5) TLDs will be used to obtain a permanent record of radiation exposure to the individual and will be maintained as part of the individual's permanent medical records.

(6) Pocket dosimeters permit the individual to monitor gamma or x-ray radiation exposure on a daily basis as a supplement to the TLD.

(7) Procedures for the use of TLD:

(a) TLDs are issued to individual workers and will be worn only by the individual to whom it is assigned.

(b) Persons who tamper with or intentionally expose dosimetry devices will be subject to disciplinary action.

(c) TLDs will be stored in an approved and designated storage area when not in use and during nonduty hours. A control badge will be maintained at this storage location throughout the wearing period.

(d) Lost or misplaced dosimeters will be reported immediately to the AMCOM RSO for issue of a replacement.

(e) Whole body personnel monitoring devices will be normally worn below the shoulder in the chest area, above the hips, and on the outside of clothing. The front of the TLD must be facing outward.

(f) Whole body TLDs, wrist and ring dosimeters will be worn in the proximity of the greatest potential for exposure.

(g) Dosimeters will be protected from environmental exposure such as excessive heat, moisture, direct sunlight, immersion in liquid, etc.

(8) Supervisors will, prior to assigning an individual to work in a radiation area:

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(a) Request dosimetry service by having the individual complete a DD 1952 Request for Dosimetry Service to include information pertaining to prior occupational radiation exposure for submission to the AMCOM RSO.

(b) Coordinate radiation worker training with the AMCOM RSO.

(c) Provide on-site, operation-specific orientation to the worker.

(d) Provide information to female radiation workers regarding the potential effects of radiation on an unborn fetus, including dose restrictions for declared pregnant female radiation workers. Regulatory Guide 8.13 will be made available to all female radiation workers.

Upon completion of these requirements, a dosimeter will be issued to the individual.

(9) At the end of each wearing period, dosimeters will be collected and replacements provided by the AMCOM RSO.

(10) Dosimeters will be forwarded to the US Army Ionizing Radiation Dosimetry Branch (USAIRDB) for analysis.

(11) Routine reports are provided in the form of Automated Dosimetry Reports (ADR). These records are reviewed and annotated by the AMCOM RSO on a quarterly basis and maintained for each individual radiation worker. Records for visitors and occasionally exposed individuals will be provided to the individual for inclusion in permanent medical records. Contractor employee records will be provided to the contractor through the contracting officer upon termination of employment as a radiation worker.

(12) Records for AMCOM radiation workers will be provided to MEDDAC for inclusion in the individual's permanent medical records.

(13) Each individual will be provided a copy of his exposure record on an annual basis.

(14) In the event of an overexposure, the USAIRDB will notify the AMCOM RSO by telephone or electronic means immediately upon identification. The supervisor and individual involved in the overexposure will be notified. The individual will then be reassigned outside the radiation area and referred to MEDDAC for evaluation. An investigation and evaluation of the overexposure will be conducted in accordance with AR 11-9.

i. Radioactive Material and Radiation Producing Device Inventory.

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(1) Users of radioactive material will identify and maintain an inventory of all radioactive material and radiation producing devices in their area.

(2) Completed inventories will be provided to the AMCOM RSO on an annual basis and provided no later than 30 September of each year. Additions and deletions will be provided as they occur. A compiled inventory of AMCOM and tenant activities will be provided to the Security Directorate, Fire Department, and other applicable directorates or activities.

j. Standing Operating Procedures.

(1) Each licensee and supervisor responsible for operations involving the use of radioactive material and/or radiation producing devices will implement this regulation by enforcement of a Standing Operating Procedure outlining all precautions necessary to protect personnel and the environment from unnecessary exposure to ionizing radiation.

(2) Draft SOPs will be provided to the AMCOM RSO for review and comment and final approval prior to staffing. The draft SOP will be provided to the AMCOM RSC for review as appropriate.

(3) SOPs will be reviewed by the area supervisor every two years and revised as necessary.

(4) Area supervisors will ensure SOPs are conspicuously posted and/or available at the site of operation.

(5) NRC Form 3 and The Energy Reorganization Act of 1974 Section 206 must be posted in a conspicuous location at each radiation operation. In addition, the applicable SOP, this regulation, 10 CFR 19, 20, and 21, and copies of NRC licenses, ARAs, or ARPs must either be posted or a notice identifying the location where these items can be reviewed.

k. Radioactive Materials in AMCOM Managed Weapons Systems/Commodities.

(1) Radioactive sources and/or radiation producing devices will be used only when it is determined that practical substitutes do not exist and they are necessary for the accomplishment of the assigned mission. The use of radioactive material will be evaluated to the extent that all nonradioactive materials are eliminated as replacement and the use of radioactive material is justified.

(2) Requests for the use of radioactive material in new items of issue and the modification of existing radioactive items of issue will be forwarded through the AMCOM Safety Office for review.

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(3) NRC licensing and/or ARAs for the use of radioactive materials will be obtained prior to procurement and testing. The appropriate transportation, marking and labeling, safety, control, storage, handling, disposal, and maintenance procedures will be established and incorporated into the applicable technical manuals, technical bulletins, and other pertinent publications. As a minimum, the warnings provided in these publications will include:

(a) A description of the radioactive item by NSN, type number, and nomenclature, including the radioisotope, chemical, and physical form, and the quantity of the radioactive material used in microcuries or curies (or becquerels or megabecquerels) and the radiation level in millirem/hr at surface and at one meter.

(b) Recommended procedures during installation, normal use, maintenance, storage, and shipment to protect personnel from excessive radiation.

(c) Recommended procedures in case of accident or incident, to minimize radiation hazards to personnel and prevent contamination of facilities.

(d) Requirements for recording radiation exposure of personnel and the use of personnel dosimetry.

(e) Instructions for disposal.

(4) Applications for NRC licensing and ARA for the use of radioactive material in items of issue will be coordinated with the AMCOM RSO as soon as practicable upon identification of its use.

I. Facility Decommissioning.

(1) All AMCOM tenant activities and AMCOM license approved users will notify the AMCOM RSO prior to termination of operations. The AMCOM RSO will provide specific instructions for decommissioning a facility prior to releasing the building to the general public. Generally, the procedure will be as follows:

(a) A detailed report of the facility operational history will be prepared. The report will include copies of leak tests, radiation surveys, and an inventory of radioactive sources and devices used and/or stored at the facility.

(b) All radioactive material will be turned in or transferred prior to starting the survey. Equipment, worktables, and storage cabinets will be surveyed to determine the absence of residual and removable contamination prior to their removal from the controlled area.

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(c) The storage and use area(s) will be laid out in a grid format prior to starting the surveys. The survey will consist of an instrument survey and area wipe test. The number of area wipes will depend on the size of the facility.

(d) A diagram of the facility showing where survey measurements were taken shall be developed. Ensure all survey and area wipe locations are identified on the diagram.

(e) The survey package should be a stand-alone document. It is acceptable to refer to leak tests and dosimetry information that is maintained on file elsewhere, but this record should be as complete as possible.

(f) A complete copy of the survey will be submitted to Commander, US Army AMCOM, (AMSAM-SF-A), Redstone Arsenal, AL 35898-5000, for final review and approval. The AMCOM RSO will be the final approving authority for releasing a facility to the public for general use.

(2) Decommissioning Records. Each tenant facility shall maintain a decommissioning file for records that would be relevant to the decommissioning of the facility. The file should contain copies of the following records:

(a) Documentation of incidents or unusual occurrences involving the spread of contamination. The records should include any known information concerning the incident, such as the nuclide, quantity, form, concentration, and decontamination results.

(b) Copies of building diagrams and any modifications of structure and equipment in the restricted area.

(c) A list of the leak test results of sources located in the facility. The list should be updated every two years.

(d) A list describing the results of area surveys. The list should be updated every two years.

7. LASER RADIATION PROTECTION PROCEDURES.

a. Requirements. Fundamental safety requirements for laser systems, facilities, and operations are based on hazard classifications as defined in ANSI A136.1-1993, American National Standard for the Safe Use of Lasers. The full extent of control measures required must be determined on a case-by-case basis with consideration given to the hazard classification of the device, the environment in which it will be used, and the personnel associated with the laser operation.

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b. Laser Classifications. The ANSI Z136.1-1993 American National Standard for the Safe Use of Lasers will be used to derive the classification for Class 1, Class 2, Class 3 and Class 4 lasers.

c. Laser Personnel Categories.

(1) Incidental Personnel. Incidental personnel are those individuals working in an area whose work makes it unlikely they will be exposed to laser energy sufficient to damage the eyes. The local LSO will be responsible for identifying and placing personnel in this category.

(2) Laser Personnel. Laser personnel are those individuals who work routinely in laser environments and are identified as authorized operators. Engineering controls or administrative procedures, or both, ordinarily protect these individuals.

d. Medical Surveillance Program.

(1) Vision/ocular assessments are not required for personnel using Class 1, Class 2, Class 2a, or Class 3a lasers and laser systems. Routine vision screening for employment purposes may be required in accordance with Occupational Health guidelines.

(2) Vision/ocular assessments for personnel using Class 3b or Class 4 lasers and laser systems will be implemented using Personnel Categories and their specific requirements as follows:

(a) Laser Workers – Individuals who routinely work in laser environments and are identified as authorized operators by SOP for Class 3b or Class 4 laser operations will receive preplacement and termination employment assessments. Preplacement and termination assessments will follow protocol as determined by Occupational Health guidelines.

(b) Incidental Workers – Personnel working in an area whose work makes it unlikely that they will be overexposed to laser energy sufficient to damage their eyes or skin. Authorization for placing personnel in this category will be identified in the unit's SOP. These individuals will receive preplacement and termination of employment assessments following Occupational Health guidelines.

(3) In the event of a known or suspected laser overexposure for any class of laser, immediate medical examination is required.

e. Laser Operations.

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(1) Each organizational element having laser operations/devices Class 3 and above will maintain a current laser inventory within their area. The inventory will contain the information listed below. Copies of these inventories shall be provided to the AMCOM LSO NLT 30 Sep, who will use them to establish a consolidated inventory.

- (a) Location.
- (b) The manufacturer, model number, and serial number.
- (c) Responsible person and phone number.
- (d) Active medium and hazard classification.
- (e) The type of device (continuous wave or pulse).
- (f) Principle wavelength and optical density.
- (g) Beam Diameter (mm).
- (h) Beam divergence (mrad).
- (i) Avg. power output (W or mR).
- (j) Energy pulse (J).
- (k) PRF (HZ).
- (l) Pulse time.
- (m) Beam intensity (w/cm^2 or J/cm^2).
- (n) Laser application.

(2) The SOPs will govern the operation and maintenance of lasers. The SOP will address, in addition to safety precautions to avoid injury by laser light, any associated hazards such as chemical, electrical, cryogenic, fire, noise, and explosion hazards. The SOP will contain first aid instructions regarding injuries that could result from these hazards. First aid procedures will be developed in coordination with the local medical authority. First aid should not be attempted for damage produced by laser energy to human eye tissue.

(3) Personnel assigned to work with Class 3b or Class 4 lasers shall wear clothing which is free of highly reflective buttons, badges, emblems, or similar adornments.

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Rings, metal spectacle frames, and watches will not be worn if the possibility exists that they will inadvertently reflect the laser beam.

(4) Personnel working with potentially hazardous levels of laser radiation shall be furnished suitable laser goggles for the specific wavelength and optical density for the laser energy involved.

(5) Prior to using laser safety goggles, examine the goggles for visible defects. Any cracks, holes, or damage would indicate defects. Defective goggles will be discarded. If the goggles are designed to serve as impact resistant safety spectacles, replacement filter lenses should meet the requirement of the American National Standards Institute (ANSI Z87.1).

(6) Prior to working with lasers for the first time, all employees will receive full instructions on the proper use of the equipment and on the hazards associated with the equipment and the laser beam. A roster of authorized personnel for Class 3 and 4 lasers will be maintained at each laser.

(7) Electrical equipment operating at potentials in excess of the range of 10,000 to 15,000 volts may produce X-rays. The LOCAL RSO will be requested to determine if X-rays are produced. Personnel dosimeters will be worn in accordance with AR11-9, if required.

(8) An activated laser will not be left unattended except when required by a test and when precautions have been provided to prevent exposure to personnel.

(9) Personnel working with Class 3b and Class 4 lasers shall work with, or under the direct visual observation of, another person at all times while actively working with the laser. The two-man safety rule is indicated because these lasers present hazards (electrical, chemical, and explosive) which could cause unconsciousness.

(10) Additional practices and procedures for maintenance operations are as follows:

(a) Maintenance personnel should adhere strictly to the precautions outlined in TB 385-4.

(b) Only specially trained maintenance personnel will be permitted to work on laser systems.

(c) No maintenance should be performed on laser systems until the power is off and the residual charge in any power supply capacitor has been "bled-off." When maintenance must be performed on a "live" laser system, the laser output must be blocked or enclosed.

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f. Laser Facilities.

(1) Questions concerning facility design should be referred to the AMCOM RSO. Drawings for the new facilities and/or facility modification should be forwarded to the AMCOM RSO at least 60 days prior to construction for safety evaluation and approval.

(2) All windows in a Class 4 laser facility should be covered to prevent passage of a hazardous beam into an uncontrolled area and to reduce reflective surfaces.

(3) Class 4 lasers whose beams are not totally enclosed should be operated in areas free from polished and reflective surfaces. Walls and ceilings will be finished with diffuse, nongloss material.

(4) Safety interlocks shall be provided at the entrances of Class 4 laser facilities to deny access to unauthorized personnel while the laser power supply is energized and the laser is capable of firing. A warning light with an explanatory sign shall be conspicuously placed on the outside wall of a closed room to alert personnel that the laser is in operation.

(5) Mechanical/electrical blocks or physical barriers shall be installed to prevent directing the beam of a Class 3b or Class 4 laser at an angle that could endanger personnel.

(6) The beam of a Class 3b or Class 4 laser shall be terminated by a material which is not highly reflective and which is fire resistant. The composition and thickness of the material will be determined for each laser prior to initial operation to ensure the target will not be penetrated. Asbestos shall not be used to terminate the beam.

(7) Adequate ventilation will be provided for laser operations which can produce accumulations of toxic or flammable gases or infectious fumes or which, in the event of an accidental discharge of coolant from a cryogenic system, can produce an oxygen deficiency.

g. Laser Safety Training.

(1) The individual assigned as the LSO shall be provided training on the potential hazards (including bioeffects), control measures, applicable standards, medical surveillance (if applicable), and other pertinent information pertaining to laser safety. The training shall be commensurate with the highest class of laser under the control of the LSO.

(2) Safety training shall be provided to laser personnel who use Class 3a, Class 3b, or Class 4 lasers and laser systems.

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(3) Topics for inclusion in a laser safety-training program shall include, but not necessarily be limited to, the following:

- (a) Fundamentals of laser operation, physical principles, construction, etc.
- (b) Bioeffects of laser radiation on the skin and eyes.
- (d) Nonradiation hazards of lasers (electrical, chemical, etc.).
- (e) Relations of specula and diffuse reflections.
- (f) Laser and laser system classification.
- (g) Control measures.
- (h) Overall management and employee responsibilities.
- (i) Medical surveillance practices (if applicable).

(j) Required CPR for personnel servicing or working on lasers with exposed high voltages and/or the capability of producing potentially lethal electrical currents.

h. Warning Signs and Labels.

(1) The word "Caution" shall be used with all signs and labels associated with Class 2 lasers and laser systems and all Class 3a lasers and laser systems that do not exceed the appropriate maximum permissible exposure (MPE) for irradiance. The word "Danger" shall be used with all other Class 3a and all Class 3b and Class 4 lasers and laser systems.

(2) A Class 2a laser or laser system shall have a label affixed with the following instructions: "Avoid Long-term Viewing of Direct Laser Radiation." The label does not require a warning symbol but must have the designation "Class 2a Laser" clearly visible during operation.

(3) The word "Radiation" on signs and labels may be replaced by the word "Light" for lasers operating in the visible range at wavelengths greater than 400 nm and equal to or less than 700 nm.

(4) Pertinent safety information may be included during the printing of a sign or label or may be handwritten in a legible manner and shall include the following:

(a) At position 1 above the tail of the sunburst, include all special precautionary instructions such as: Invisible Laser Radiation, Knock Before Entering, Do Not Enter

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When Light Is On, Restricted Area, etc. Additionally, protective actions that the reader should know will also appear in position 1. These actions include:

1 For Class 2 and Class 3a lasers and laser systems where the accessible irradiance does not exceed the approximate MPE bases on a 0.25 second exposure, the statement "Laser Radiation – Do Not Stare Into Beam or View With Optical Instruments."

2 For all other class 3a lasers and laser systems, "Laser Radiation – Avoid Direct Eye Exposure."

3 For all Class 3b lasers and laser systems, "Laser Radiation – Avoid Direct Exposure To Beam."

4 For Class 4 lasers and laser systems, "Laser Radiation – Avoid Eye or Skin Exposure To Direct Or Scatter Radiation."

(b) At position 2 below the tail of the sunburst, the type of laser (Ruby, Helium-Neon, etc.) or the wavelength, the pulse duration (if appropriate), and the maximum output should be listed.

(c) At position 3, list the class of the laser or laser system.

i. Disposal. Laser devices should not be sold to individuals not qualified to safely operate these devices. Local, state, and Federal laws restricting possession or transfer of lasers shall be followed when lasers are disposed. **MILITARY EXEMPT LASERS CANNOT BE TRANSFERRED OUTSIDE OF DOD WITHOUT SPECIAL PERMISSION THROUGH THE DEPUTY UNDERSECRETARY OF DEFENSE (DOD 4160.21-M-1).** Disposal of all lasers and laser systems shall be coordinated through the AMCOM RSO.

8. MICROWAVE AND RADIO FREQUENCY ELECTROMAGNETIC RADIATION SAFETY.

a. Hazard Evaluation and Exposure Control.

(1) The Permissible Exposure Limit (PEL) for all personnel is 0.4 watts per kilogram (W/kg) whole body specific absorption rate (SAR) as averaged over any 6-minute period. Averaging is used to obtain the maximum exposure potential. Exposures separated by more than 6 minutes are considered separate physiological events under ANSI Standard C95.1 (1999).

(2) Derived equivalent PELs for restricted and unrestricted areas can be found in tables 1 and 2 of US Army Environmental Hygiene Agency Technical Guide No. 153.

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(3) Significant evidence has shown that a fetus is at no greater risk than the mother during a pregnancy: therefore, a fetus will not receive any greater exposure than the mother.

(4) The RFR equipment that radiates at frequencies below 1000 MHz and delivers less than 7 watts of radio frequency power to the radiating device is considered non-hazardous.

b. Medical Surveillance. There is no requirement for a medical surveillance program for RFR workers because there is no scientific basis or epidemiological evidence to suggest ocular surveillance is necessary.

c. Investigation of Incidents.

(1) All incidents involving alleged or actual overexposure to RFR must be investigated and documented (refer to AR 40-400 and AR 385-40.)

(2) Investigations of incidents involving alleged or actual exposures of five times the PEL or greater must include, as a minimum, measurements of exposure levels, appropriate medical examination, a detailed description of the circumstances surrounding the incident, recommendations for medical follow-up, if necessary, and recommendations to prevent recurrence of the incident.

(3) If a known or suspected overexposure occurs, notify the AMCOM RSO by telephone as soon as possible after the incident or accident occurs.

(4) A copy of all investigations shall be forwarded to the AMCOM RSO no later than 20 days after the initial telephone notification.

d. The RFR Hazard Training. All occupational workers will receive RFR hazard training. Training will be conducted during basic technical training or before assignment to work areas involving RFR exposure. Personnel will be given annual refresher training to reemphasize training objectives. All training will be documented.

e. RFR Hazard Warning Signs.

(1) The format for RFR hazard warning signs can be found in ANSI C95.1 (1999). Subdued signs are authorized for tactical use provided the general wording and layout of the sign adhere to ANSI C95.1 (1999).

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(2) The RFR hazard warning signs are required at all access points to areas in which RFR levels may exceed the PEL or derived equivalent PELs. Appropriate information will be inserted on the signs. Competent safety and occupational health professionals may waive this requirement when military operational considerations prevent posting of such signs.

(3) In areas where access to RFR levels greater than 10 times the PEL may exist, warning signs alone will not provide adequate protection. Other warning devices and controls, such as flashing lights, audible signals, fences, or interlocks, will be required depending on the potential risk of exposure.

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APPENDIX A

REFERENCES

1. AR 40-5 Preventative Medicine, 15 Oct 90
2. AR 11-9 The Army Radiation Safety Program, 28 May 99
3. AR 40-66 Medical Record Administration and Health Care Documentation, 03 May 99
4. AR 40-68 Quality Assurance Administration, 20 Dec 89
5. AR 40-400 Patient Administration, 12 Mar 01
7. AR 25-400-2 The Modern Army Recordkeeping System (MARKS), 26 Feb 93
8. AR 200-1 Environmental Protection and Enhancement, 21 Feb 97
9. AR 200-2 Environmental Effects of Army Actions, 23 Dec 88
10. AR 385-10 with AMC Supplement, Army Safety Program, 29 Feb 00
11. AR 385-16 System Safety Engineering and Management, 03 May 90
12. DA Pam 385-3 Protective Clothing and Equipment, 05 Mar 76
13. AR 385-40 with AMC Supplement, Accident Reporting and Records, 1 Nov 94
15. AMCR 385-25 Radiation Safety, 21 Jun 99
16. AMCR 385-100 Safety Manual, 26 Sep 95
17. AMC Pam 385-1 Fundamentals of Health Physics for the Radiation Safety Officer, 18 April 84
18. TB 43-180 Calibration and Repair Requirements for the Maintenance of Army Materiel, 1 Nov 98
19. TB 43-0116 Identification of Radioactive Items in the Army Supply System, 01 April 98
20. TB 43-0197 Instructions for Safe Handling, Maintenance, Storage and Disposal of Items Managed by US Army Armament Materiel Readiness Command

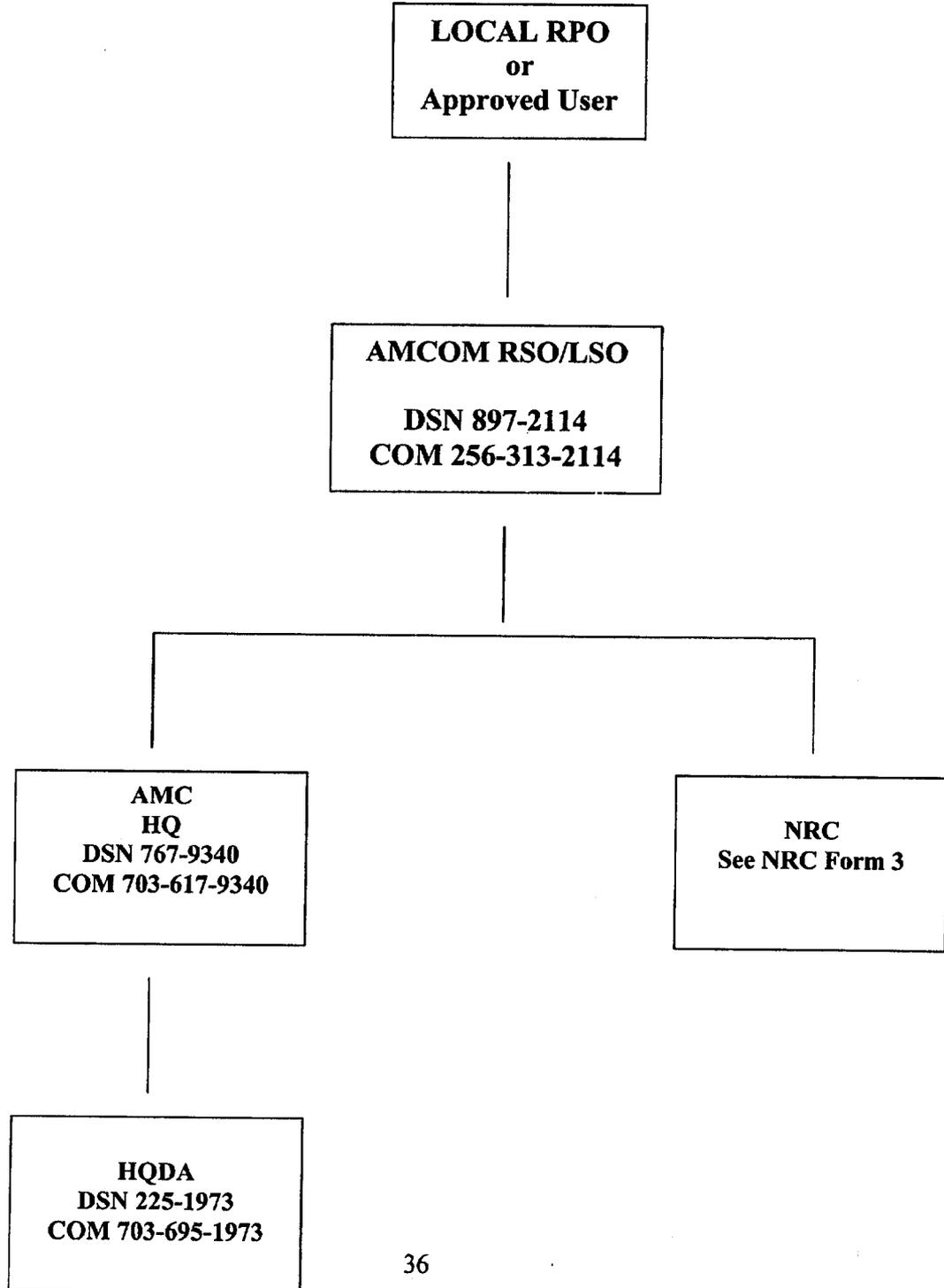
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21. TB 43-0108 Handling, Storage and Disposal of Army Aircraft Components Containing Radioactive Material
22. TB 385-4 Safety Precautions for Maintenance of Electrical/Electronic Equipment, 1 Aug 92
23. TB MED 523, Controls of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound, 15 Jul 80.
24. MIL-STD 129J Military Standard, Marking for Shipping and Storage
25. SB 11-206 Personnel Dosimetry Supply and Service for Technical Ionizing Radiation Exposure Control, 31 May 80
26. TM 3-261 Handling and Disposal of Unwanted Radioactive Material
27. AMCOM Supplement to AR 385-16 Army Safety Program
28. AMCOMR 75-3 Control of Hazardous Type Materials Incident to Transportation, 31 July 2001
29. AMCOMR 200-2 Hazardous Waste Management Program, 16 Feb 94
30. AMCOMR 385-19 Processing Standing Operating Procedures for Hazardous Operations
31. AMCOM Pam 725-1 Installation Supply Accounting System Handbook
32. National Bureau of Standards Handbook 107 Radiological Safety in the Design of Particle Accelerators
33. National Bureau of Standards Handbook 111 Radiation Safety for X-ray Diffraction and Fluorescence Analysis Equipment
34. National Bureau of Standards Handbook 114 General Safety Standards for Installations Using Non-Medical X-ray and Sealed Gamma Sources, Energies up to 10 MeV.
35. Title 10 Code of Federal Regulations (CFR) Part 19, Notices, Instructions, and Reports to Workers: Inspection
36. Title 10 CFR Part 20, Standards for Protection Against Radiation
37. Title 10 CFR Part 21, Reporting of Defects and Noncompliance

AMCOMR 11-1 (APPENDIX A CONTINUED)

38. Title 29 CFR, Part 1910
39. Title 49 CFR Parts 170-189 Inclusively
40. NUREG-0303 (Rev 1) Reporting Noncompliance/Safety Defects Under Title 10 Code of Federal Regulations, Part 21
41. NRC Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposure As Low As Reasonable Achievable.
42. NRC Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure.
43. NRC Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure.
44. USAEHA TG No. 153, Guidelines for Controlling Potential Health Hazards from Radio Frequency Radiation.
45. ANSI C95.1 (1999), Control of Hazards to Health from Microwave and Radio Frequency Electromagnetic Fields.
46. ANSI C95.3 (1991), Techniques and Instrumentation for the Measurement of Potentially Hazardous Electromagnetic Radiation at Microwave Frequencies.
47. ANSI Z136.1-1993, American National Standard for the Safe Use of Lasers.
48. DODI 6055.11 Protection of DOD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers, 06 May 1996.
49. ANSI Z87.1, American National Standard Practices for Occupational and Educational Eye and Face Protection.

APPENDIX B
RADIATION INCIDENT NOTIFICATION TREE
(MINIMUM KEY CONTACTS)



AMCOMR 11-1

APPENDIX C
INTERNAL RADIATION SAFETY AUDIT WORKSHEET

1. Date

2. Location(s) Building No. _____

Room No. _____

3. Authorized User(s)

4. Describe scope of lab use (Nuclide, form, frequency, purpose, etc.)

5. Training

a. Frequency: _____ Conducted By: _____

b. Does each radiation worker understand safety practices? () Y () N

6. Do you have an AMCOM RSO approved SOP? () Y () N

7. Is the date on your SOP greater than 5 years? () Y () N

AMCOMR 11-1 (APPENDIX C CONTINUED)

Remarks:

8. Surveys

a. Types of surveys performed. Circle appropriate survey (daily, weekly, monthly, etc.).

b. Is instrumentation properly calibrated and used? Y N

c. Are records maintained: trigger levels established, area diagram, instrument used, individual performing survey, results in proper units, decontamination performed as necessary, etc. Y N

Remarks:

9. Receipt and Transfer

a. Are incoming packages properly surveyed? Y N

Is there a radioactive material movement form for each shipment and receipt?
 Y N

b. Are shipment records maintained? Y N

Remarks:

10. Personnel Dosimetry.

a. Is appropriate dosimetry assigned and worn? Y N

b. Are annual results provided to radiation workers? Y N

11. Handling Waste

a. Are procedures followed? Y N

AMCOMR 11-1 (APPENDIX C CONTINUED)

- b. Proper storage (area, containers, labeling, etc.)? Y N
- c. Do you generate liquid waste disposal? Y N
Do you generate solid waste disposal? Y N
- d. Do you compact waste? Y N
- e. Do you discharge liquid waste in the sanitary sewer? Y N
- f. Are records maintained? Y N

Remarks:

- 12. Have you conducted a semiannual inventory? Y N
- 13. Have you submitted a copy of your inventory to AMCOM RSO? Y N
- 14. Do you maintain copies of your records? Y N

Remarks:

15. Storage and use of Radioactive Material (RAM)

- a. Adequate method to prevent unauthorized access? Y N
- b. Are all keys to rooms and sources under the control of the RPO? Y N
- c. Condition of area acceptable? Y N
- d. No eating, drinking, or smoking in use/storage areas? Y N
- e. No food, drink, or personal items stored in use/storage areas? Y N
- f. Use of shielding/distance while using/storing material? Y N
- g. RAM is under surveillance and control when not in storage in an unrestricted area? Y N

AMCOMR 11-1 (APPENDIX C CONTINUED)

Remarks:

16. Posting and labeling

- a. NRC-3 "Notice to Workers" Y N
- b. Parts 19, 20, 21, section 206 of Energy Reorganization Act, procedures for part 21, and license documents or a notice indicating where documents can be examined? Y N
- c. Other posting and labeling requirements met? Y N

**APPENDIX D
FORMAT FOR LASER OR HIGH INTENSITY OPTICAL SOURCE SOP**

This appendix is intended to suggest areas that should be included in unit SOPs. This list is not necessarily complete, but will serve as an aid to ensure all requirements for safe laser operations are included in the SOP.

- a. Purpose.
- b. Scope: Laser(s) or high intensity optical sources covered by the SOP.
- c. Responsibilities.
- d. Description of laser(s). Includes information specified in Laser/High Intensity Optical Source inventory.
- e. Description of facilities: ambient light conditions; target area (including buffer zones, beam backstop, enclosures); ventilation; warning signs and lights; interlocks; and associated hazards, such as electrical, mechanical, hydraulic, pneumatic, ionizing radiation, noise, toxic materials, cryogenics, asphyxiants, etc.
- f. Preoperational procedures; personnel control including authorized users and exclusion of unauthorized personnel and interlock description and checkout.
- g. Shutdown procedures.
- h. Maintenance procedures.
- i. Additional information: Required laser eye wear (optical density for specific wavelength), skin protection, safe viewing distance of beam and of diffuse reflection, and first aid procedures.

APPENDIX E
GLOSSARY

Except as indicated, definitions of technical terms in Glossary: Title 10, Parts 19 and 20, Code of Federal Regulations; Title 21, Food and Drugs, Chapter 1, Subchapter J, Radiological Health, Part 1040; Performance Standards for Light-Emitting Products (Federal Standards), Technical Bulletin Medical (TB MED) 524, TB MED 523, and USAEHA Technical Guide No. 153 will be used in the interpretation of this directive.

1. Activity (Radioactivity) – The number of nuclear transformations occurring in a given quantity of material per unit time. The unit of measurement is the curie (Ci) or becquerel (Bq).
2. ADR – Automated Dosimetry Report – The computerized report provided by the AIRDC that shows a record of individual radiation exposure.
3. AIRDB – US Army Ionizing Radiation Dosimetry Branch.
4. ALARA – An acronym for “As Low As Reasonably Achievable” refers to an operating philosophy in which occupational radiation exposures are reduced as far below specified limits as is reasonably achievable.
5. Bioassay – The analysis of excreta, urine, blood samples, whole body counting or other means of collecting biological data to determine internal radiation exposures.
6. Byproduct Material – Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.
7. Calibration – The determination of a measuring instruments variation from a standard which is traceable to the National Bureau of Standards to ascertain necessary correction factors or acceptability of detection capability within a specified error range.
8. Commodity (Radioactive) – An item of government property composed in whole or in part of a radioactive material to which a National Stock Number (NSN) or part number has been assigned. A radioactive commodity is any item in the DOD Supply System that contains radioactivity equal to or greater than quantities listed in 10 CFR 20, or contains a specific activity greater than 0.002 microcuries per gram of radioactive material (49 CFR) and is license exempt.
9. ARA – Army Radiation Authorization
10. ARP – Army Radiation Permit

AMCOMR 11-1 (APPENDIX E CONTINUED)

11. Decontamination – The reduction or removal of radioactive contamination from any given surface.
12. Dose – A general term denoting the quantity of radiation or energy absorbed.
13. Dose Equivalent – The product of absorbed dose, quality factor, and other necessary modifying factors used to obtain an evaluation of the effects of radiation received by exposed persons so that the different characteristics of the exposure are taken into account.
14. Dosimeter – A device used to detect and measure an accumulated dose of radiation, e.g., personnel dosimetry badge or self-reading pocket dosimeter.
15. Exposure (Occupational) – Exposure to ionizing radiation incurred by an employee whose duties may result in such exposure. It does not include exposures that are incident to medical diagnosis, therapy, or background radiation.
16. Internal Radiation Hazard – Exposure resulting from deposition of radioactive material within the body through inhalation, ingestion, or absorption through the skin.
17. Ionizing Radiation – Electromagnetic or particulate radiation capable of producing ions, directly or indirectly in its passage through matter. For the purpose of the regulation, alpha and beta particles, gamma rays, x-rays, and neutrons are examples of ionizing radiation. This type of radiation does not include radio waves, infrared, visible, or ultraviolet light, or lasers.
18. Leak Test – A determination of the integrity of a sealed source encapsulation by measurement of the amount of radioactive material escaping the encapsulation.
19. Rad – The unit of absorbed dose equivalent to 0.01 J/Kg in any medium.
20. Radioactive Material – Any material or combination of materials that emit ionizing radiation. This includes natural elements such as radium and accelerator-produced radionuclides.
21. Radiation Producing Device – Materials, equipment, or devices which generate or are capable of generating ionizing radiation including (1) naturally occurring radioactive material, (2) by-product materials, (3) source materials, (4) special nuclear materials, (5) nuclear reactors, (6) radiographic and fluoroscopic equipment, (7) particle generators and accelerators, and (8) radiofrequency generators such as klystrons and magnetrons which produce x-rays.
22. Rem – The special unit of dose equivalent numerically equal to the absorbed dose in rad multiplied by the quality factor and any other necessary modifying factors.

AMCOMR 11-1 (APPENDIX E CONTINUED)

23. **Sealed Source** – Any radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent the release or dispersal of such radioactive material under the most severe conditions that may be encountered in normal use and handling.

24. **Source Material** – Uranium or thorium, or any combination thereof, in any physical or chemical form. It also includes any ore that contains by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combinations thereof. Source material does not include special nuclear material.

25. **Special Nuclear Material** – Plutonium, Uranium 233, uranium enriched in the isotope 235, and other material the NRC determines to be special nuclear material, or any material (except source material) artificially enriched by and of the foregoing.

26. **TLD** – Thermoluminescent Dosimeter

27. **LASER** – Light Amplification by Stimulated Emission of Radiation.

28. **Laser System (LS)** – An assembly of electrical, mechanical, and optical components that include one or more lasers. This definition includes weapon systems for which there are individual development or acquisition efforts by separate developers to produce component laser devices. For example, a tank equipped with a laser range finder is a "laser system."

29. **Exempt Laser System (ELS)** – A laser system that has been given an exemption from the Federal standard by an agency of the Department of Defense whose use and disposal are strictly controlled. See AR 11-9.

30. **Laser Safety Officer (LSO)** – An individual designated by the major subordinate commander/chief and approved by the AMCOM RSO; who is qualified by virtue of education and/or experience to make informed judgments regarding safety control measures needed for laser operations. An LSO will be appointed when a facility possesses a Class 3 or Class 4 laser or a Class 1 enclosed laser or laser system. The LSO can be the Local RSO if so designated in writing.

31. **Nominal Ocular Hazard Distance (NOHD)** – The NOHD for direct intrabeam viewing is the minimum distance beyond which an unprotected individual may stand and view the beam and can be exposed repeatedly without injury, provided that one does not look at the laser with unfiltered optical devices. When viewing the collimated beam with a telescope or any other optically magnifying device, the hazardous range is greatly increased.

AMCOMR 11-1 (APPENDIX E CONTINUED)

32. Maximum Permissible Exposure (MPE) – The level of laser radiation to which a person may be exposed without hazardous effect or adverse biological changes in the eye or skin.

33. Accessible Emission Limit (AEL) – The maximum accessible emission level permitted within a particular laser class.

$$\text{AEL} = \text{MPE} \times (\text{area of limiting aperture})$$

34. Permissible Exposure Limit (PEL) – The maximum level expressed in absorption rate or derived equivalent power density, electric field strength, or magnetic field strength to which an individual may be exposed that will not cause detectable bodily injury according to present medical knowledge.

35. Specific Absorption Rate (SAR) – The time rate at which RFR energy is imparted to an element of biological body mass. It is usually measured in W/kg or normalized to incident power density in W/kg/mW/cm².

36. Power Density – The amount of power per unit area in an electromagnetic field, usually expressed in mW/cm²

**Supplement 11
(NRC Form 313, Item 11)**

Waste Management

Disposal of radioactive materials will be performed in accordance with current applicable Federal, State and Army regulations and requirements and guidance provided by the DOD Radioactive Waste Manager located at U.S. Army Field Services Command (AFSC), Rock Island, IL. Prior to disposal of radioactive material, packaging and storage will be approved by the AMCOM RSO, the MSIC, DIA RSO and/or the MSIC, DIA RCC.

Financial Assurance and Recordkeeping for Decommissioning

Funding for decommissioning will be obtained when necessary. A worst-case estimate for decommissioning based on extrapolations of the table in 10 CFR 30.35(d) is \$1,000,000. Decommissioning costs based on previous operating history are expected to be minimal. Records will be maintained as required in 10 CFR 30.35.

Item 10.5

AR 11-9

The Army Radiation Safety Program

Army Regulation 11-9

Army Programs

**The Army
Radiation
Safety
Program**

**Headquarters
Department of the Army
Washington, DC
28 May 1999**

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Headquarters
Department of the Army
Washington, DC
28 May 1999

*Army Regulation 11-9

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Army Programs

The Army Radiation Safety Program



Louis Caldera
Secretary of the Army

History. This is a new regulation.

Summary. This regulation prescribes Army radiation safety policy. It is a consolidation of several regulations that partially covered this policy. It implements DODI 6055.8 and DODI 6055.11. It includes Army policy for the use, licensing, disposal, transportation, dosimetry, accident reporting, safety design, and inventory control of and radiation exposure standards for ionizing and nonionizing radiation sources. This regulation updates policy to be consistent with current Federal radiation safety regulations; simplifies Army radiation authorization, Army radiation permit, and Nuclear Regulatory Commission license application procedures; requires Army radiation authorizations for the use of machine-produced ionizing radiation; and strengthens MACOM and installation radiation safety authority.

Applicability. This regulation applies to the Active Army, the Army National Guard of the

United States, the Army Reserve, and Army contractors. This regulation does not apply to nuclear weapons (AR 50-5).

Proponent and exception authority. The proponent of this Army regulation is the Director of the Army Staff (DAS). The DAS has the authority to approve exceptions to this regulation that are consistent with controlling law and regulation. The DAS may delegate this authority, in writing, to a division chief within the proponent agency in the grade of colonel or civilian equivalent.

Army management control process. This regulation contains management control provisions and identifies key management controls that must be evaluated.

Supplementation. Supplementation of this regulation is prohibited without prior approval from HQDA (DACS-SF), WASH DC 20310-0200.

Suggested improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA (DACS-SF), WASH DC 20310-0200.

Distribution. This publication is available in electronic media only and is intended for command level C for Active Army and D for Army National Guard of the United States.

*This regulation supersedes AR 40-14, 30 June 1995; AR 40-46, 15 November 1974; AR 385-9, 1 April 1982; and AR 385-11, dated 1 May 1980
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Summary of Change

AR 11-9

Army Programs

The Army Radiation Safety Program

This publication—

- Establishes radiation safety policies and procedures for all ionizing and nonionizing radiation sources used by Army personnel or on Army installations (located throughout).
- Establishes the position of Army Radiation Safety Officer (para 1-4).
- Establishes the Army Radiation Safety Council (para 1-5).
- Provides personnel radiation exposure standards (table 5-1).
- Provides radioactive contamination guidelines and radioactive waste disposal instructions (para 5-3).
- Provides radiation accident and incident reporting policies (chap 6).
- Provides instructions for applying for Nuclear Regulatory Commission licenses, Army radiation authorizations, and Army radiation permits (chap 2).
- Integrates risk management into the Army radiation safety program (chap 1).

Chapter 1 Introduction

1-1. Purpose

This regulation establishes policies and procedures for the use of, licensing, disposal, transportation, safety design, and inventory control of ionizing and nonionizing radiation sources. It also provides radiation exposure standards and dosimetry and accident reporting instructions. Its objective is to assure safe use of radiation sources and compliance with all applicable Federal and DOD rules and regulations.

1-2. References

Required and related publications are listed in appendix A.

1-3. Explanation of terms

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

1-4. Responsibilities

- a. The Assistant Secretary of the Army (Installations and Environment) (ASA(I&E)) establishes overall Army environment, safety, and occupational health policy and maintains general oversight of and serves as advocate for the Army Radiation Safety Program.
- b. The Assistant Secretary of the Army (Manpower and Reserve Affairs) establishes overall Army health and preventive medicine policy and maintains oversight of medical and health aspects of the Army Radiation Safety Program.
- c. The Director of Army Safety (DASAF), Office of the Chief of Staff, Army, will—
 - (1) Provide Army Staff oversight of the Army Radiation Safety Program.
 - (2) Administer, direct, and integrate Army Force Protection risk management (AR 385-10).
 - (3) Chair the Army Radiation Safety Council (ARSC).
 - (4) In coordination with the ASA (I&E), designate, in writing, a qualified nuclear medical science officer (SSI 72A67C) colonel to serve as Army Radiation Safety Officer (Army RSO).
- d. The Commanding General, Army Materiel Command (AMC) will—
 - (1) Control NRC (Nuclear Regulatory Commission) licenses and Army radiation authorizations for Army radioactive commodities.
 - (2) Provide ionizing radiation dosimetry services (at the Army Ionizing Radiation Dosimetry Center (AIRDC)) that meet the requirements of 10 CFR 20.1501(c). The Chief, AIRDC, will—
 - (a) Publish instructions for starting, maintaining, and ending personnel dosimetry services (SB 11-206).
 - (b) Maintain the Army's Central Dosimetry Records Repository (CDRR). The CDRR will archive comprehensive dosimetry records for all Army personnel and for other personnel who use Army dosimetry services. Records will meet the requirements of 10 CFR 20.2106 and 20.2110. Records will include results of bioassays, administrative dose assignments (including copies of documents that make the assignments), and supplementary occupational dose equivalent information (for example, dosimetry information resulting from off-duty employment, "moonlighting") that any radiation safety officer (RSO) reports. In particular, the AIRDC will meet the requirements of 10 CFR 20.2106(f) for long-term retention of these records.
 - (c) Provide quarterly personnel dosimetry reports (automated dosimetry record (ADR)) to RSOs for all personnel who received dosimetry services during the previous calendar quarter. These reports will enable supported RSOs to meet all recordkeeping requirements in 10 CFR 20.2106.

- (d) Provide reporting services that enable RSOs to meet all requirements of 10 CFR 19.13, 29 CFR 1910.1096(n) and (o), and 29 CFR 1926.53(p) and (q).
 - (e) Provide reporting services that meet the requirements of 10 CFR 20.2206.
 - (f) Notify immediately (by telephone or message) the RSO, The Surgeon General (TSG), the major Army command (MACOM) radiation safety staff officer (RSSO), and the Army RSO when AIRDC records indicate that any Army personnel ionizing radiation exposure standard (table 5-1) may have been exceeded.
- (3) Provide Army low-level radioactive waste disposal services (TM 3-261) (at the Army Low-Level Radioactive Waste Disposal Division, U.S. Army Industrial Operations Command, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000). In addition:
 - (a) Establish procedures for implementing the Army's responsibility as DOD Executive Agent for Low-Level Radioactive Waste Disposal.
 - (b) Maintain records of all Army radioactive waste disposal by burial.
 - (4) Provide the Army radiation test, measurement, and diagnostic equipment (TMDE) program and accredited radiation instrument calibration services (AR 750-43 and TB 750-25).
 - (5) In coordination with CG, U.S. Army Medical Command (MEDCOM), maintain capability to provide on-site radiation safety support following radioactive material contamination accidents and incidents.
 - (6) Assure that foreign military sales of radioactive material (RAM) and items that contain RAM comply with applicable United States regulations and DOD directives.
- e. The Surgeon General will—
 - (1) Establish Army radiation safety personnel exposure standards as necessary and provide them to the Army RSO for promulgation (para 1-4I(3)).
 - (2) Approve all radiation dose limits in excess of limits promulgated in this regulation (chap 5) and provide these limits to the Army RSO for promulgation as necessary (para 1-4I(3)).
 - (3) Establish and promulgate Army radiological health guidelines for deployment operations as necessary.
 - (4) Provide Army Staff supervision on the medical and health aspects of exposure to ionizing radiation associated with doses that AIRDC documents.
 - f. The Commanding General, Training and Doctrine Command (CG, TRADOC), will—
 - (1) Include appropriate radiation safety training in MOS/SSI-producing courses and in unit mission-essential task list (METL) profiles for personnel in MOS/SSIs (military occupational specialty/specialty skill identifier) and TOE units that use radiation and radioactive commodities.
 - (2) Prepare training modules [in coordination with CG, AMC and CG, Army Medical Department Center and School (CG, AMEDDC&S), about protection from U.S. and foreign ionizing and nonionizing radiation sources that may expose Army personnel to radiation during deployment. These modules will be available for radiation safety training of deploying and deployed personnel as necessary.
 - g. The Commanding General, U.S. Army Medical Command will—
 - (1) Prepare training modules (at AMEDDC&S), in coordination with CG, TRADOC and CG, AMC about health hazards of, protection from, and medical treatment of injuries caused by U.S. and foreign radiation sources that may expose Army personnel during deployment. These modules will be available for radiation safety training of deploying and deployed personnel as necessary.
 - (2) In coordination with CG, AMC, maintain capability to provide on-site medical advice and support following radioactive contamination accidents or incidents (AR 40-13).

- (3) Survey each installation and each NRC license, Army reactor permit, or Army radiation authorization (ARA) holder at least once every three years for compliance with applicable radiation safety and health regulations and guidance (AR 40-5).
 - (4) Establish appropriate occupational health surveillance for personnel occupationally exposed to radiation (AR 40-5).
 - (5) Perform health hazards assessments (HHAs) of commodities and systems that emit radiation or contain RAM as early as practical in development and before fielding (AR 40-10).
 - (6) Provide radiation bioassay services (AR 40-5) that comply with criteria of the American National Standards Institute (ANSI) (see ANSI N13.30). Such services are available from the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) on a cost-reimbursable basis.
 - (7) Provide medical support for investigations of alleged excessive radiation exposures (DODI 6055.11 and DA PAM 40-18).
- h. The Assistant Chief of Staff for Installation Management (ACSIM) will provide oversight for all radioactive contamination surveys conducted in support of base closure or installation restoration activities.
- i. Each MACOM commanding general will—
- (1) Assure installation and subordinate command compliance with conditions of AMC-held radioactive commodity NRC licenses and ARAs. (See para 2-1b.)
 - (2) Designate, in writing, a person to be the MACOM RSSO.
 - (3) Issue ARAs as necessary (para 2-3).
 - (4) As necessary, establish and employ procedures to assure that captured, purchased, borrowed, or otherwise obtained foreign equipment and materiel are surveyed for RAM and that appropriate actions are taken following discovery of any RAM in those items.
 - (5) Concerning the MACOM radiation safety program:
 - (a) Establish review and approval procedures for conducting risk management in accordance with established doctrine (DODI 6055.1).
 - (b) Maintain a central register of risk decisions regarding deviations from the Army standards of this regulation and DA PAM 40-18 within the command.
 - (c) Assure that the complete risk management process is executed before the conduct of all operations.
 - (6) Report excess military-exempt lasers to the Defense Reutilization and Marketing Service for utilization screening within DOD (DOD 4160.21-M-1). (See para 3-2c.)
 - (a) Maintain accountability during the screening period.
 - (b) Losing and gaining organizations will transfer excess directly between themselves.
 - (c) After utilization screening is completed, identify supply system requirements for usable parts. Return required parts to the supply system.
- j. Each installation commander—
- (1) Will designate, in writing, a qualified individual to be Installation RSO.
 - (2) May establish an Installation Radiation Safety Committee (RSC). (See para 1-6.)
 - (3) Will prepare and maintain historical records of location of use or storage of RAM on the installation and the responsible activity for that use or storage (para 2-5).
 - (4) Will maintain documentation listing locations categorized as "RF controlled" and "RF uncontrolled" environments as necessary (DODI 6055.11).
 - (5) Issue Army radiation permits as necessary (para 2-4).
- k. Each commander will—
- (1) Designate, in writing, a person to be the RSO when any of the following is true.

- (a) When a NRC license, Army reactor permit, ARA, or applicable technical publication requires it.
 - (b) When para 5-2b requires any personnel in the command to wear AIRDC-issued dosimetry.
 - (c) When para 5-2c requires any personnel in the command to participate in a bioassay program.
 - (d) When the activity operates, maintains, or services a class IIIb or class IV laser system (section 1.3, ANSI Z136.1) that is not type-classified. The title of the person so designated may be "laser safety officer" (LSO).
- (2) When paragraph (1) above requires the designation of an RSO (or LSO)—
 - (a) Establish written policies and procedures to assure compliance with applicable Federal, DOD, and Army radiation safety regulations and directives. These documents will include emergency reaction plans as necessary and procedures for investigating and reporting radiation accidents, incidents, and overexposures (chap 6).
 - (b) Assure that an internal (for example, the RSO or local acting IG (Inspector General)) or external (for example, the TSG (para 1-4g(3)) or an RSO from another command) agent or agency audits the radiation safety program annually.
 - (3) Assure that all personnel occupationally exposed to radiation receive appropriate radiation safety training commensurate with potential hazards from radiation sources they may encounter.
 - (4) Maintain an inventory of radiation sources as higher headquarters directs and in accordance with requirements of NRC licenses, Army reactor permits, ARAs, and technical publications.
 - (5) For radioactive commodities in the command, establish written policies and procedures as necessary to assure compliance with radiation safety requirements in applicable technical publications. (See para 2-1b(1).)
- i. The Army Radiation Safety Officer will—
 - (1) On behalf of the DASAF, direct the Army Radiation Safety Program.
 - (2) On behalf of the DASAF, develop, manage, and promulgate Army radiation safety policy and guidance.
 - (3) On behalf of TSG, promulgate Federal and Army radiation safety personnel exposure standards within the Army.
 - (4) On behalf of the ASA (I&E), provide HQDA oversight of the DOD Executive Agency for Low-Level Radioactive Waste, to include matters concerning depleted uranium.
 - (5) Resolve radiation safety issues between MACOMs as necessary.
 - (6) Promote good radiation safety practices throughout the Army.
 - (7) Provide radiation safety consultation to the DA staff and MACOM commanders and staffs.
 - (8) Serve as HQDA radiation safety point-of-contact with other DOD and Federal agencies.
 - (9) Represent HQDA on DOD radiation safety committees, working groups, and panels.
 - (10) Coordinate HQDA-level radiation safety plans and responses to radiation emergencies, accidents, and incidents.
 - (11) Integrate risk management into the Army Radiation Safety Program.
 - m. Major Army command RSSOs will—
 - (1) Assure MACOM implementation of Army radiation safety policy.
 - (2) Direct the MACOM radiation safety program.
 - (3) Establish MACOM radiation safety policy.

- (4) Provide radiation safety consultation to the MACOM commanding general and staff and to subordinate commanders and staffs.
- (5) Serve as MACOM radiation safety point-of-contact.
- n. Each Installation RSO will—
 - (1) Direct the installation radiation safety program.
 - (2) Assist TOE (Table of Organization and Equipment) units on the installation to meet requirements of NRC licenses and ARAs for radioactive commodities. In particular, the installation RSO will—
 - (a) Assure that TOE unit personnel receive appropriate radiation safety training as necessary.
 - (b) Meet all reporting requirements for accidents or incidents (para 6-2).
 - (c) Assure appropriate inventory control per applicable technical publications and logistics regulations.
 - (3) Notify the AMC RSSO when a building or area that currently or formerly contained radioactive commodities is scheduled for demolition or will no longer contain radioactive commodities. This is to provide AMC radioactive commodity license holders appropriate notice so that they can take decommissioning actions as necessary.
- o. Each RSO (or LSO), including the installation RSO, will—
 - (1) Perform or be responsible for the performance of all radiation safety functions that applicable Federal, DOD, and Army regulations and NRC license, Army reactor permit, and ARA conditions require.
 - (2) Establish plans and procedures for handling credible emergencies involving radiation and radioactive materials. This includes coordination with civilian and military emergency response organizations as necessary.
 - (3) Coordinate with supporting medical personnel to help assure that personnel receive appropriate occupational health surveillance (AR 40-5).
 - (4) For an RSO with laser safety responsibilities, assume the responsibilities of an LSO as listed in section 1.3.2, ANSI Z136.1, except for occupational health responsibilities. (The RSO or LSO will assist the occupational health physician as necessary in meeting laser occupational health responsibilities.)

1-5. Army Radiation Safety Council

- a. The ARSC is the Chief of Staff, Army's advisory body to provide recommendations for Army radiation safety directives and to gather and disseminate information about the status of the Army radiation safety program.
- b. Membership includes the DASAF as chair (para 1-4c(3)), the Army RSO as recorder, the Radiological Hygiene Consultant to TSG, a representative of the ACSIM (Assistant Chief of Staff for Installation Management), a representative of the Army Reactor Office (AR 50-7), and the RSSO from each MACOM, the National Guard Bureau, and the Office, Chief Army Reserve.
- c. The ARSC will meet at least once each 6 month period and at the call of the chair.

1-6. Installation Radiation Safety Committee

- a. The installation RSC is the installation commander's advisory body to gather and disseminate information about the status of the installation radiation safety program.
- b. Membership includes a chair that the commander designates, the installation RSO (recorder), and all tenant RSOs. Installations with large numbers of TOE unit personnel that use radioactive commodities will include military representatives knowledgeable about the TOE units' radiation safety programs.
- c. Each installation RSC will meet at least once each calendar year and at the call of the chair.

1-7. Radiation Safety Committee

When a technical publication or conditions of a NRC license, Army reactor permit, or ARA require an RSC, it will meet the following requirements in addition to any other requirements of applicable directives.

- a. The RSC will meet at least once in each six-month period and at the call of the chair.
- b. A representative of the commander (that is, the commander or someone at the executive level in the organization who is not a radiation user) should chair the RSC. The RSO should be recorder and will be a voting member. The installation RSO may be a non-voting member.
- c. The RSO will provide a copy of the minutes of each RSC meeting to the installation RSO.

1-8. General

- a. Although a commander may assign radiation safety functions and the organizational location of the RSO (or LSO) to anywhere in the organization, the RSO and LSO will have direct access to the commander for radiation safety purposes as necessary.
- b. Keep personnel exposure to ionizing radiation at a level as low as is reasonably achievable (ALARA).
- c. Organizations involved in research, development, testing, and evaluation (RDTE), and in acquisition of equipment that emits radiation or contains RAM will-
 - (1) Identify hazards and controls and incorporate protection measures or identify operational restrictions before fielding.
 - (2) Process residual risks for acceptance per AR 70-1 and AR 385-16 before fielding materiel.
- d. Proponents of technical publications will include radiation safety requirements about siting, operation, and maintenance of commodities and systems that contain RAM or emit radiation, as appropriate.
- e. Army overseas controls of radiation sources will be at least as protective as are Army domestic controls.
- f. Use risk management to identify the options and residual risk for decision by the decision authority. See FM 25-101 and FM 101-5 for a detailed discussion of steps for performing the risk management process.

1-9. Deviations

- a. Limit deviations to only those from Army radiation safety standards and procedures. Deviations from Federal and DOD regulations and standards and from NRC license, Army reactor permit, and ARA conditions, including those implemented in technical publications, are not authorized.
- b. The following personnel may authorize deviations from Army standards and procedures (para a above). (Deviations from personnel radiation exposure standards require TSG's approval.)
 - (1) Each MACOM commanding general.
 - (2) The Superintendent, U.S. Military Academy.
 - (3) The Chief, National Guard Bureau (NGB). (The Chief, NGB may sub-delegate deviation authority to the State Adjutant Generals.)
- c. Only personnel listed in paragraph b above may approve residual risk levels deemed to be high or extremely high. Authority to accept residual risk will be per FM 101-5. For the purpose of this paragraph, the personnel listed in paragraph b above are considered MACOM commanding generals.
- d. Grant deviations for 1 year or less. The respective approval authority may approve deviation renewals provided conditions cited in the original deviation remain the same.
- e. Any accident or mishap occurring under an approved deviation will cause automatic termination of the approval until the respective approving authority completes an investigation and re-validates the deviation.

- f. Forward requests through command channels to HQDA (DACS-SF), WASH DC 20310-0200, for waivers and exceptions to Federal or DOD radiation safety regulations. Prior approval from HQDA (DACS-SF), WASH DC 20310-0200, is required before such requests are sent to a Federal agency or to DOD. Prior approval of TSG is also required before requests for waivers or exceptions to Federal or DOD personnel radiation exposure standards are sent to a Federal agency or to DOD.

Chapter 2

Ionizing Radiation Sources

2-1. General

- a. Materiel. AR 70-1 applies to developmental and non-developmental materiel containing radiation sources.
- b. Compliance with NRC regulations and NRC license, Army reactor permit, and ARA conditions.
 - (1) All Army personnel using RAM will comply with all applicable NRC regulations and conditions of NRC licenses, Army reactor permits, and ARAs held by their own or by another command (paras 2-2a(2) and 2-3b(2)).
 - (2) Holders of NRC licenses, Army reactor permits, and ARAs will assure that all personnel using RAM are aware of applicable regulations and conditions as appropriate.
- c. Shielding and control designs. A qualified expert will design, review, and test shielding and controls for access to radiation areas, high radiation areas, and very high radiation areas. Perform these procedures per applicable regulations and guidelines before routinely using radiation sources within the area. Each design for high radiation and very high radiation areas will receive an additional independent review by a qualified expert that the MACOM RSSO designates.
- d. Environmental requirements. See 10 CFR 51, 40 CFR, AR 200-1, and AR 200-2 for RAM environmental requirements.

2-2. Nuclear Regulatory Commission licenses

The NRC licenses special, source, and byproduct material in the U.S. and its possessions.

- a. Send applications for new licenses, license renewals, and license amendments through command channels to the MACOM headquarters for forwarding to the NRC.
 - (1) The MACOM commanding general may allow subordinate commanders to forward applications directly to the NRC without MACOM review.
 - (2) When compliance with conditions proposed in the application requires efforts of personnel of another command, obtain a letter of agreement from an authorized representative of that command (paras 1-4(5) and 2-1b).
 - (3) The applicant or MACOM RSSO will provide a copy of all correspondence relating to applications to Commander, CHPPM, Aberdeen Proving Ground, MD 21010-5422.
 - (4) Tenant commanders will provide a copy of each NRC license, including all amendments, to the installation commander.
- b. Except as specified in paragraphs 1-9f and 2-2a, all Army personnel may communicate directly with the NRC without restriction. However, a person considering such communication should also consider whether information to be requested is obtainable from Army sources and whether information provided or obtained is of interest to the chain of command or other Army organizations.

2-3. Army radiation authorizations

- a. The Army uses ARAs to control specific Army ionizing radiation sources (including machines that emit ionizing radiation) that the NRC does not license. An ARA is required for all such sources except

- (1) Byproduct, source, or special material that the NRC has declared to be license-exempt (10 CFR 30, sections 30.14 through 30.20; 10 CFR 40, sections 40.13 and 40.14; and 10 CFR 70, section 70.14) or generally licenses (10 CFR 31; 10 CFR 40, sections 40.20 through 40.28; and 10 CFR 70, section 70.19).
 - (2) Less than 0.1 microcurie (μCi) [3.7 kilobecquerels (kBq)] of radium.
 - (3) Less than 1 (μCi) (37 kBq) of any naturally occurring or accelerator produced RAM (NARM) other than radium. See paragraph c(2) for other NARM exemptions.
 - (4) For electron tubes containing less than 10 (μCi) (370 kBq) of any NARM radioisotope.
 - (5) For machine-produced ionizing radiation sources not capable of producing a high radiation area or very high radiation area. (For example, medical and dental diagnostic x-ray systems do not require an ARA.) However, commanders will establish policies and procedures to assure that design and use of these excepted sources are in compliance with applicable radiation safety regulations and guidelines and that only appropriately trained and authorized personnel operate them.
 - (6) For Army nuclear reactors and Army reactor-produced RAM that remains at the reactor site. The Army Reactor Office issues Army reactor permits for these sources (AR 50-7).
- b. Forward applications for new ARAs, ARA renewals, and ARA amendments through command channels to MACOM headquarters for approval.
- (1) Use DA Form 3337, Application for Army Radiation Authorization (appendix B) for new ARAs. Use either DA Form 3337 or a memorandum that refers to the original DA Form 3337 for ARA renewals and amendments.
 - (2) When compliance with conditions proposed in the application requires efforts of personnel of another command, obtain a letter of agreement from an authorized representative of that command (paras 1-4l(5) and 2-1b).
 - (3) The MACOM RSSO will assure that applications meet appropriate regulatory and advisory guidelines before sending approval through command channels to the applicant.
 - (4) Tenant commanders will provide a copy of each ARA, including all amendments, to the installation commander.
- c. The Army's ARA program will be similar to the NRC's licensing program. The Army will apply NRC regulations and guidance, modified as necessary, in its control of ARA ionizing radiation sources. Most ARA conditions will be similar to standard NRC license conditions.
- (1) When an ARA applicant possesses or is applying for a NRC license to which ARA RAM use can be linked the application need only reference the NRC license. The issued ARA may reference the NRC license and incorporate the expiration date and all conditions of the NRC license.
 - (2) The NRC's regulations regarding license-exempt concentrations (10 CFR 30.14) and quantities (10 CFR 30.18) will be applied similarly to NARM with respect to ARA exemption upon HQDA approval. Applicants for such exemptions will send supporting documents through command channels to HQDA (DACS-SF), WASH DC 20310-0200.
- d. The MACOM RSSO will provide a copy of all correspondence relating to ARA applications to Commander, CHPPM, Aberdeen Proving Ground, MD 21010-5422.
- e. A sample ARA is in figure 2-1.

2-4. Army radiation permits

Non-Army agencies (including civilian contractors) require an Army radiation permits (ARP) to use, store, or possess ionizing radiation sources on an Army installation (32 CFR 655.10). (For the purpose of this paragraph, ionizing radiation source means any source that, if held or owned by an Army organization, would require a specific NRC license or ARA.)

- a. The non-Army applicant will apply by letter with supporting documentation (para b below) through the appropriate tenant commander to the installation commander. Submit the letter so that the installation commander receives the application at least 30 days before the requested start date of the permit.

- b. The ARP application will specify start and stop dates for the ARP and describe for what purposes the applicant needs the ARP. The installation commander will approve the application only if the applicant provides evidence to show that one of the following is true.
 - (1) The applicant possesses a valid NRC license or Department of Energy (DOE) radiological work permit that allows the applicant to use the source as specified in the ARP application.
 - (2) The applicant possesses a valid Agreement State license that allows the applicant to use RAM as specified in the ARP application, and the applicant has filed NRC Form-241, Report of Proposed Activities in Non-Agreement States, with the NRC in accordance with 10 CFR 150.20. An ARP issued under this circumstance will be valid for no more than 180 days in any calendar year.
 - (3) For NARM and machine-produced ionizing radiation sources, the applicant has an appropriate State authorization that allows the applicant to use the source as specified in the ARP application or has in place a radiation safety program that complies with Army regulations.
 - (4) For overseas installations, the applicant has an appropriate host-nation authorization as necessary that allows the applicant to use the source as specified in the ARP application and has in place a radiation safety program that complies with Army regulations. (Applicants will comply with applicable status-of-forces agreements [SOFAs] and other international agreements.)
- c. All ARPs will require applicants to remove all permitted sources from Army property by the end of the permitted time.
- d. Disposal of RAM by non-Army agencies on Army property is prohibited. However, the installation commander may authorize radioactive releases to the atmosphere or to the sanitary sewerage system that are in compliance with all applicable Federal, DOD, and Army regulations. (The installation commander also will give appropriate consideration to State or local restrictions on such releases.)
- e. A sample ARP is in figure 2-2.

2-5. Decommissioning records

- a. Holders of NRC licenses will establish and maintain decommissioning records in accordance with 10 CFR 30.35(g), 40.36(f), and 70.25(g), as applicable.
- b. Holders of ARAs will establish and maintain decommissioning records similar to those that the NRC requires.
- c. Holders of NRC licenses and ARAs will provide information about the location of use and storage of RAM to the installation commander for the installation RAM history records (para 1-4j(3)).

2-6. Transfer and transport

- a. Transfer radioactive material only to persons authorized to receive and possess it.
 - (1) The holder of the commodity license or ARA will in accordance with technical publications and applicable instructions establish transfer of Army radioactive commodities.
 - (2) For all other RAM, the shipper will obtain and retain appropriate evidence (for example, a copy of the recipient's ARA or NRC or Agreement State license) before shipping the RAM.
- b. Domestic shipments of RAM will be in accordance with applicable NRC (10 CFR 71), Department of Transportation (DOT) (49 CFR), and U.S. Postal Service (39 CFR) regulations and per DOD 4500.9-R (Part II). International shipments of RAM will be per applicable U.S. and International Atomic Energy Agency (IAEA) transportation regulations.
- c. Do not transfer radium and items containing radium to non-DOD agencies or activities (except for disposal as radioactive waste).

2-7. Radioactive waste disposition

- a. Do not bury radioactive waste on Army property.
- b. Coordinate with and obtain the approval of the Chief, Army Low-Level Radioactive Waste Disposal Division, U.S. Army Industrial Operations Command, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000, for all disposal by burial on non-Army property of radioactive wastes.
 - (1) This includes approval for the off-site storage, packaging, shipment, treatment, and final disposition of such unwanted low-level RAM.
 - (2) Project managers of special projects, such as U.S. Army Corps of Engineers environmental restoration projects that generate unusually large amounts of radioactive waste may arrange for radioactive waste disposal as part of the project. However, they will coordinate such actions with the Chief, Army Low-Level Radioactive Waste Disposal Division (para 1-4d(3)(b)).
- c. Release of RAM to the atmosphere or to the sanitary sewerage system will comply with all applicable NRC and EPA regulations. (Also, give appropriate consideration to State or local restrictions on such releases.)
- d. If allowed by applicable regulations or by NRC license, Army reactor permit, or ARA conditions, RAM may be held for decay and subsequent disposal without regard to radioactivity. However, disposal of such material may still require special handling as hazardous waste (AR 40-5).

2-8. Survey instruments

Calibrate radiation survey instruments used for health or safety purposes at least annually using National Institute of Standards and Technology (NIST)-traceable radiation sources (AR 750-43 and TB 750-25).

- a. Some instruments may require more frequent calibration. Consult applicable technical publications and with TMDE personnel for appropriate calibration intervals as necessary.
- b. Calibration sources will be of a type and activity appropriate for the intended use of the instrument.

DEPARTMENT OF THE ARMY
HQ, MACOM
CITY, STATE, AND ZIP CODE

REPLY TO ATTENTION OF

XXXX-XX (11-XXm)

15 January 2000

MEMORANDUM FOR Commander, U.S. Army Activity, Installation, City,
State XXXXX-XXXX

SUBJECT: Army Radiation Authorization (ARA) No. XXX-XX

1. Reference memorandum, HQ, U.S. Army Activity, XXXX-XX-X, 15 November 1999, subject: Application for Renewal of Army Radiation Authorization No. XXX-XX, and enclosures thereto.

2. In accordance with referenced memorandum ARA No. XXX-XX is amended in its entirety to read as follows:

a. Expiration date: 31 January 2002.

b. Description of machine-produced ionizing radiation source and of radioactive material, its chemical and/or physical form, and maximum amount at any one time authorized under this ARA: See enclosure.

c. Authorized use: See enclosure.

d. Radiation Safety Officer: CPT Dan Hamilton.

e. Conditions: See enclosure.

3. Except as specifically provided otherwise in this ARA, conduct your program in accordance with the statements, representations, and procedures in the documents, including any enclosures, listed: referenced memorandum.

4. Our point of contact is Mr. John A. Manfre, MACOM Radiation Safety Staff Officer, DSN XXX-XXXX.

FOR THE COMMANDER:

Encl

RUPERT K. THORNE

as

LTC, GS

Adjutant

Figure 2-1. Sample Army radiation authorization

DEPARTMENT OF THE ARMY INSTALLATION

CITY, STATE, AND ZIP CODE

October 7, 1999

Radiation Safety Office

Mr. Peter H. Myers

President, Myers and Associates, Inc.

19900 W. 49th Street

Austin, Texas 78799

Dear Mr. Myers:

This letter responds to your application dated September 20, 1999, for an Army radiation permit to use a lead-paint analyzer containing no more than 30 millicuries (1.11 gigabecquerels) of cadmium-109. Your application meets the requirements of Army Regulation 11-9 (The Army Radiation Safety Program) and of title 32, Code of Federal Regulations, part 655, section 655.10.

The (Installation) Commander hereby permits you to use the lead-paint analyzer on this installation during the period October 8 through November 22, 1999 in accordance with the terms specified in your application.

You must remove all radioactive material from the installation by the end of the permitted time and provide evidence to indicate that you have done so. We do not permit disposal of radioactive material on Army property. Reapply if you wish to use the lead-paint analyzer on this installation after November 22, 1999.

Sincerely,

John A. Manfre

Radiation Safety Officer

Figure 2-2. Sample Army radiation permit

Chapter 3 Lasers

3-1. General

- a. The design of Army laser safety programs will follow applicable guidelines in ANSI Z136.1 and ANSI Z136.3. Military-exempt laser users will comply with laser safety requirements in applicable technical publications.
- b. Army laser range safety guidance is in AR 385-63 and MIL-HBK 828.
- c. Use a type-classified or commercial class IIIb or class IV laser on an Army range only if the DOD Laser Systems Safety Working Group or CHPPM has performed a prior laser hazard evaluation for that specific kind of laser.
 - (1) A list of approved lasers is in MIL-HDBK-828. Send requests for approval of an unlisted laser through command channels to Commander, CHPPM, ATTN: MCHB-DC-OLO, Aberdeen Proving Ground, MD 21010-5422.
 - (2) Use an unlisted class IIIb and class IV laser on an Army range for RDTE purposes only. Users of such lasers will comply with paragraph a.
- d. Only a qualified expert will design, review, and test controls for access to a class IIIb or IV laser facility. Meet this requirement in accordance with applicable directives before routinely using class IIIb or IV lasers within such a facility. A qualified expert will design or review for adequacy all radiation safety SOPs (standing operating procedures) for each such facility.
- e. Use only class I, class II, and class IIIa lasers indoors on Army installations as hand-held laser pointing devices. Do not use class IIIb or class IV lasers for such purposes.

3-2. Military-exempt lasers

- a. Although exempt, military-exempt lasers will meet as many of the laser safety standards in 21 CFR 1040 as practical.
- b. Proponents of military-exempt lasers will include laser safety requirements in technical publications about siting, operation, and maintenance of these lasers and laser systems.
- c. Dispose of unwanted military-exempt lasers in accordance with DOD 4160.21-M-1. Do not dispose of potentially usable lasers or laser parts through utilization outside DOD, donation, or sale without the prior approval of the Deputy Undersecretary of Defense (Environmental Security) or designee. Send requests for such disposition through supply channels to the commanding general of the appropriate materiel readiness command.
- d. Military-exempt lasers will not include lasers intended primarily for indoor classroom training and demonstration, industrial operations, scientific investigations, or medical applications.
- e. Commanding General, USACHPPM, will maintain records for all military-exempt lasers that indicate types of laser products and manufacturers.

Chapter 4 Radiofrequency electromagnetic radiation

4-1. General

- a. The Army will comply with RF (radiofrequency) radiation safety program elements in DODI 6055.11. Type-classified RF EMR (electromagnetic radiation) emitting system users will comply with radiation safety requirements in applicable technical publications.
- b. Adopt no practice and conduct no operation involving planned exposure of personnel to RF levels in excess of the applicable maximum permissible exposures in DODI 6055.11.
- c. Do not use radiofrequency protective clothing for routine use to protect personnel. Protective equipment, such as electrically insulated gloves and shoes for protection against RF shock and burn or for insulation from the ground plane is permissible where necessary for compliance with induced current limits in DODI 6055.11.

- d. Identify, attenuate, or control potentially hazardous radiofrequency (RF) electromagnetic fields and other radiation hazards associated with Army electronic equipment by engineering design, protective equipment, administrative actions, or a combination thereof.
- e. Proponents of RF electromagnetic radiation-emitting systems will include radiation safety requirements in technical publications about siting, operation, and maintenance of these systems.

4-2. Measurement and evaluation of RF fields

Use measurement procedures and techniques recommended in IEEE C95.3 as basic guidance for evaluating RF hazards.

- a. Commanding General, CHPPM, will maintain records of surveys, reports, calculations, and control measures for each type-classified RF EMR emitter.
- b. Where multiple RF EMR emitters are located in fixed arrangements, RF evaluation data will include a determination of weighted contributions from expected simultaneously operated emitters.

Chapter 5

Radiation safety standards, dosimetry, and recordkeeping

5-1. General

Personnel exposure limits in this chapter do not apply to doses or exposure due to background radiation, due to any medical administration the individual has received, or due to voluntary participation in medical research programs.

5-2. Ionizing radiation

- a. Personnel exposure standards. Table 5-1 summarizes the Federal personnel radiation exposure standards that the Army follows.
 - (1) Unrestricted areas. The dose in any unrestricted area from external sources will not exceed 2 millirems (mrem) [0.02 millisievert (mSv)] in any one hour.
 - (2) Nuclear Regulatory Commission jurisdiction. Standards for exposure to ionizing radiation emitted from NRC-licensed RAM are in 10 CFR 20. The Army also applies these standards to Army reactors and to a combination of exposures to NRC-licensed RAM and other ionizing radiation sources.
 - (3) Occupational Safety and Health Administration (OSHA) jurisdiction. Federal standards for occupational exposure to all other ionizing radiation sources are in OSHA regulations (29 CFR 1910.1096 and 1926.53). However, adhere to NRC standards for all ionizing radiation sources when NRC standards are more protective than OSHA standards.
- b. Dosimetry. All occupationally exposed personnel using AIRDC dosimetry services will wear a whole-body dosimeter (worn closest to the source of radiation exposure on the trunk between the shoulders and waist). Wear supplemental dosimeters as necessary to monitor exposures to specific organs or areas, such as the thyroid, finger, hand, lens of eye, and fetus or embryo.
 - (1) Monitor, using AIRDC-supplied dosimeters (see para(2)), occupational exposure of all personnel working in Army facilities or on Army projects (including Army Corps of Engineers civil works projects) for:
 - (a) Adults likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the occupational limits in table 5-1.
 - (b) Minors and declared pregnant women likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the applicable limits in table 5-1.
 - (c) Individuals entering a high or very high radiation area.

- (2) Personnel at Army government-owned contractor-operated (GOCO) facilities and contractor personnel who are working in Army facilities and require dosimetry will use AIRDC-supplied dosimeters unless a written contract specifically exempts them. (Non-GOCO contractor personnel working under provisions of an ARP may use contractor-supplied dosimetry.)
 - (3) AIRDC dosimeters may be used to monitor the exposure of other personnel and for area monitoring. Evaluate requirements for continued use of AIRDC dosimetry for such purposes periodically (at least annually).
 - (4) DA PAM 40-18 contains instructions for wearing supplemental dosimeters.
- c. Bioassay.
- (1) Monitor occupational intake of RAM and, as necessary, assess the committed effective dose equivalent (CEDE) for:
 - (a) Adults likely to receive, in 1 year, an intake in excess of 10 percent of applicable annual limits of intake (ALI). The ALIs for NRC-licensed RAM are in table 1, columns 1 and 2, 10 CFR 20, appendix B. The Surgeon General will provide, as necessary, ALIs and related air and water concentrations for radioisotopes used under ARA authority and not listed in 10 CFR 20, appendix B to the Army RSO for promulgation.
 - (b) Minors and declared pregnant women likely to receive, in 1 year, a CEDE in excess of 0.05 rem (0.5 mSv).
 - (2) Intake of RAM may be monitored and the CEDE assessed for other individuals. Evaluate the requirement for continued intake monitoring periodically (at least annually).
 - (3) All Government- and contractor-provided bioassay will be in accordance with procedures in ANSI N13.30.
- d. Dosimetry and bioassay records.
- (1) All personnel will complete DD Form 1952, Dosimeter Application and Record of Occupational Radiation Exposure, before receiving AIRDC dosimetry or participating in a routine bioassay program.
 - (2) The RSO will provide a copy of determinations of administrative doses (para e), determinations of non-Army occupational dose histories (obtained from somewhere other than AIRDC), bioassay results, and results of assessing CEDE by bioassay or by determination of the time-weighted air concentrations to which an individual has been exposed [that is, derived air concentration (DAC)-hours] to the AIRDC for archiving.
 - (3) The RSO will provide a copy of each DD Form 1952 and calendar year ADR for routinely monitored personnel to the supporting medical treatment facility or occupational health clinic (AR 40-66). (Examples: A visitor monitored only during a short-term visit of a few days is not routinely monitored. A student or intern monitored over a period of a few months is routinely monitored.)
- e. Administrative doses.
- (1) Only TSG may approve assigning an administrative dose in place of any AIRDC-recorded occupational dose equivalent that exceeds a value in table 5-1.
 - (2) RSOs will estimate TEDE (total effective dose equivalent) or CEDE when they cannot determine it from dosimetry or bioassay (for example, if a dosimeter was lost, damaged, or believed to be deliberately exposed). The estimate of the administrative dose may be based on any of the following.
 - (a) Occupancy or workload information and radiation dose levels at the radiation source operator location.
 - (b) Data supplied by a supplemental dosimeter.
 - (c) Average of the individual's previous occupational dose for the preceding 6 to 12 months if conditions prevailed similar to those during the period for which the dose is being estimated.

- (d) Recorded doses accrued by coworkers performing similar duties under similar circumstances.
- (3) The RSO will document the reason for the administrative dose assignment and the method used to estimate it.
 - (a) For alleged overexposures, the RSO will forward request for approval of the administrative dose, with supporting documentation, through command channels to TSG.
 - (b) For all other administrative dose assignments, the RSO will provide a report to Chief, AIRDC, to be included with the person's records in the CDRR.
- f. Other requirements. Federal requirements for security of RAM; control of access to radiation areas, high radiation areas, and very high radiation areas; caution signs; posting and labeling requirements; radioactive material shipping and receiving; and so on are in 10 CFR, 29 CFR 1910.1096 and 1926.53, 49 CFR, and other applicable documents listed in the References section (app A).

5-3. Radioactive contamination

In the absence of other regulatory or advisory guidance, a surface is contaminated if either the removable or total radioactivity is above the levels in table 5-2.

- a. If a surface cannot be decontaminated promptly to levels below those in table 5-2, control, mark, designate, or post it per applicable regulations.
- b. Always reduce radioactive contamination to levels ALARA.
- c. Local commanders may use contamination standards more strict than those in table 5-2 but will not use standards less strict without applying risk management principles (para 1-9).

5-4. Nonionizing radiation

See table 5-3 for a description of the electromagnetic radiation spectrum. Refer to the following indicated references for personnel radiation exposure standards for the following types of nonionizing radiation.

- a. Lasers: ANSI Z136.1 and ANSI Z136.3.
- b. Ultraviolet, visible, infrared, and extremely low frequency electromagnetic radiation and static electric fields: (latest edition of) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVsTM) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIsTM).
- c. Radiofrequency electromagnetic radiation: DODI 6055.11.
- d. Static magnetic fields: International Commission on Non-Ionizing Radiation Protection (ICNIRP), "Guidelines on Limits of Exposure to Static Magnetic Fields," *Health Physics*, vol. 66, January, 1994, pp. 100-106.

Table 5-1.
Army Personnel Ionizing Radiation Exposure Standards.

Category	Maximum ^{1,2,3}
Member of the general public	100 mrem (1 mSv) (TEDE) in calendar year ⁴
Fetus/embryo of occupationally exposed declared pregnant woman	500 mrem (5 mSv) (DDE of mother + ED due to radionuclides in fetus/embryo) for entire pregnancy
Occupational exposure of adults	5 rem (0.05 Sv) (TEDE) in calendar year
Lens of the eye	15 rem (0.15 Sv) (EDE) in calendar year ³
Individual organ	50 rem (0.5 Sv) (DDE + CDE) in calendar year
Skin or extremity	50 rem (0.5 Sv) (SDE) in calendar year
Occupational exposure of minors	10% of limits for adults

-
1. From 10 CFR 20. Refer to 10 CFR 20 for detailed standards.
 2. Abbreviations: TEDE = total effective dose equivalent; DDE = deep dose equivalent; ED = effective dose; EDE = effective dose equivalent; CDE = committed dose equivalent; SDE = shallow dose equivalent.
 3. OSHA standard for occupational exposure of adults and for the lens of the eye is 1¼ rem in calendar quarter. OSHA standard for skin of whole body is 7½ rem in calendar quarter. OSHA standard for hands and forearms; feet and ankles is 18¼ rem in calendar quarter.
 4. The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with applicable regulations, will not exceed 2 mrem (0.02 mSv) in any one hour.
-

Table 5-2.
Surface Radioactivity Values in dpm/100 cm²

Nuclide ^a	Removable ^{b, c}	Total (Fixed + Remov- able ^{b, d})
nat U, ²³⁵ U, ²³⁸ U, and associated decay products	1,000	5,000
Transuranics, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I	20	500
nat Th, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³¹ I, ¹³³ I	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and others noted above ^e	1,000	5,000
Tritium and tritiated compounds ^f	10,000	NA

- a. See para 5-3 for applicability of this table. This table is extracted from 10 CFR 835, appendix D. The values in this table apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, apply the limits established for alpha- and beta-gamma-emitting nuclides independently.
- b. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
- c. The amount of removable radioactive material per 100 cm² of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note: The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and ²²⁸Ra, ²²⁷Ac, ²²⁸Th, ²³⁰Th, ²³¹Pa and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.
- d. The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm² is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide G if: (1) From measurements of a representative number n of sections it is determined that $\frac{1}{n} \sum_{i=1}^n S_i \geq 3G$, where $S_i \geq G$ is the dpm/100 cm² determined from measurement of section i ; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm² area exceeds 3G.
- e. This category of radionuclides includes mixed fission products, including the ⁹⁰Sr which is present in them. It does not apply to ⁹⁰Sr which has been separated from the other fission products or mixtures where the ⁹⁰Sr has been enriched.
- f. Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface radioactivity value provided in this table is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore a "Total" value does not apply.

**Table 5—3.
Electromagnetic Radiation.**

REGION	WAVELENGTH	FREQUENCY	AUTHORITY
Ionizing (gamma and x rays)	< 100 nm	> 3 PHz ($E > 12.4$ eV)	NRC and OSHA
Ultraviolet (UV)	100 to 380-400 nm	0.75-0.79 to 3 PHz	ACGIH
Visible (light)	380-400 to 760-780 nm	380-390 to 750-790 THz	ACGIH
Infrared (IR)	760-780 nm to 1 mm	300 GHz to 380-390 THz	ACGIH
Radiofrequency	1 mm to 100 km	3 kHz to 300 GHz	DOD
Extremely low frequency	> 100 km	< 3 kHz	ACGIH
Static electric fields	NA	NA	ACGIH
Static magnetic fields	NA	NA	ICNIRP

Notes.

1. Unit abbreviations: nm = nanometer (10^{-9} m); mm = millimeter (10^{-3} m); km = kilometer (10^3 m); PHz = petahertz (10^{15} Hz); THz = terahertz (10^{12} Hz); GHz = gigahertz (10^9 Hz); kHz = kilohertz (10^3 Hz); and eV = electron volt (1 eV = 1.6×10^{-19} J).
2. Wavelength x frequency = speed of light = 3×10^8 m s⁻¹.
3. Authority = The regulating authority for personnel exposure for the purposes of this regulation (para 5-4).

**Chapter 6
Special reporting requirements**

6-1. General

- a. Reporting requirements of AR 40-5, AR 385-40, and DA PAM 40-18 apply for radiation accidents, incidents, and over-exposures. Additional requirements are in paras b and 6-2.
- b. IMMEDIATELY EVACUATE PERSONNEL SUSPECTED OF EXPERIENCING POTENTIALLY DAMAGING EYE EXPOSURE FROM LASER RADIATION TO THE NEAREST MEDICAL FACILITY FOR AN EYE EXAMINATION (See FM 8-50). LASER EYE INJURIES REQUIRE IMMEDIATE SPECIALIZED OPHTHALMOLOGIC CARE TO MINIMIZE LONG-TERM VISUAL ACUITY LOSS. MEDICAL PERSONNEL SHOULD OBTAIN MEDICAL GUIDANCE FOR SUCH EMERGENCIES FROM THE WALTER REED ARMY INSTITUTE OF RESEARCH DETACHMENT AT BROOKS AFB (Commercial [800] 473-3549).
- c. Notify the installation or activity public affairs officer at the onset of the accident or incident in order to activate public affairs contingency measures (AR 360-5). Radiation accidents or incidents attract the attention of local and national media quickly. Early disclosure of accurate information is vital to maintaining the confidence of both the internal and external public.

6-2. Ionizing radiation

Federal reporting requirements for accidents, incidents, and over-exposures are in 10 CFR 20, subpart M and in 29 CFR 1910.1096(m) and 1926.53(o).

- a. Send information copies of all reports required by 10 CFR 20.2201 through 20.2205, 29 CFR 1910.1096(m), or 29 CFR 1926.53(o) and of any other accident or incident report to the NRC or OSHA through command channels to HQDA (DACS-SF), WASH DC 20310-0200.
- b. Reports through command channels will meet the same time requirements, as do required reports to the NRC and OSHA. For example, if the NRC requires immediate telephonic notification, follow it with immediate telephonic notification through the chain of command to HQDA (DACS-SF), WASH DC 20310-0200.

Appendix A Publications

Section I Required Publications

ANSI N13.30

American National Standards Institute, Performance Criteria for Radiobioassay. (Cited in para 1-4e(6).) (This publication may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.)

ANSI Z136.1

American National Standards Institute, American National Standard for Safe Use of Lasers. (Cited in paras 1-4k(e), 1-4n(5), 3-1a, and 5-4a.) (This publication may be obtained from the Laser Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

ANSI Z136.3

American National Standards Institute, American National Standard for the Safe Use of Lasers in Health Care Facilities. (Cited in paras 3-1a, and 5-4a.) (This publication may be obtained from the Laser Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

AR 40-5

Preventive Medicine. (Cited in paras 1-4g(3), (4), and (6); 1-4n(4); 2-7d; and 6-1a.)

AR 40-10

Health Hazard Assessment Program (HHA) in Support of the Army Materiel Acquisition Decision Process. (Cited in para 1-4g(5).)

AR 40-13

Medical Support-Nuclear/Chemical Accidents and Incidents. (Cited in para 1-4g(2).)

AR 40-66

Medical Record Administration. (Cited in para 5-2d(3).)

AR 50-7

Army Reactor Program. (Cited in paras 1-5b and 2-3a(6).)

AR 70-1

Systems Acquisition Policy and Procedure. (Cited in paras 1-8c and 2-1a.)

AR 200-1

Environmental Protection and Enhancement (Cited in para 2-1d.)

AR 200-2

Environmental Effects of Army Actions. (Cited in para 2-1d.)

AR 360-5

Public Information. (Cited in para 6-1c.)

AR 385-10

Army Safety Program. (Cited in para 1-4c(2).)

AR 385-40

Accident Reporting and Records. (Cited in para 6-1a.)

AR 385-63

Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat. (Cited in para 3-1b.)

AR 750-43

Army Test, Measurement and Diagnostic Equipment Program. (Cited in paras 1-4d(4) and 2-8.)

DA PAM 40-18

Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation. (Cited in paras 1-4g(7), 1-4i(5)(b), 5-2b(4), and 6-1a.)

DOD 4160.21-M-1

Defense Demilitarization Manual. (Cited in para 3-2c.)

DOD 4500.9-R (Part II)

Defense Transportation Regulation - Cargo Movement. (Cited in para 2-6b.)

DODI 6055.1

DOD Occupational Safety and Health Program (Cited in para 1-4i(5)(a).)

DODI 6055.11

Protection of DOD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers. (Cited in paras 4-1a through c, 1-4g(7), 1-4j(4), and 5-4c.)

FM 8-50

Prevention and Medical Management of Laser Injuries. (Cited in para 6-1b.)

FM 25-101

Battle Focused Training. (Cited in para 1-8f.)

FM 101-5

Staff Organization and Operations. (Cited in paras 1-8f and 1-9c.)

IEEE C95.3

Institute of Electrical and Electronics Engineers, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields RF and Microwave. (Cited in para 4-2.) (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

MIL-HDBK-828

Laser Range Safety. (Cited in paras 3-1b and 3-1c(1).) (This publication may be obtained from the Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094.)

SB 11-206

Personnel Dosimetry Supply and Service for Technical Ionizing Radiation Exposure Control. (Cited in para 1-4d(2)(a).)

TB 750-43

Army Test, Measurement, and Diagnostic Equipment (TMDE) Calibration and Repair Support Program. (Cited in paras 1-4d(4) and 2-8.)

Title 10, CFR, Chapter I

Nuclear Regulatory Commission. (Cited in paras 1-4d(2), 1-4d(2)(b) through (e); 2-1d; 2-3a(1) and (4); 2-3c(2); 2-4b(2); 2-5a; 5-2a(1), c(1)(a), and f; 6-2; and 6-2a.)

Title 21, CFR, Subchapter J

Radiological Health. (Cited in paras 3-2a.)

Title 29, CFR, Part 1910

Occupational Safety and Health Standards. (Cited in paras 1-4d(2)(d), 5-2a(2) and f, 6-2, and 6-2a.)

Title 32, CFR, Part 655

Radiation Sources on Army Land. (Cited in para 2-4.)

Title 39, CFR

U.S. Postal Service. (Cited in para 2-6b.)

Title 40, CFR

Environmental Protection Agency. (Cited in para 2-1d.)

Title 49, CFR

Department of Transportation. (Cited in paras 2-6b and 5-2f.)

TM 3-261

Handling and Disposal of Unwanted Radioactive Material. (Cited in para 1-4d(3).)

Unnumbered Publication

ACGIH Threshold Limit Values (TLVs™) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs™). (Cited in para 5-4b.) (This publication may be obtained from the American Conference of Governmental Industrial Hygienists, Technical Affairs Office, 1330 Kemper Meadow Dr., Cincinnati, OH 45240.)

Unnumbered publication

International Commission on Non-Ionizing Radiation Protection (ICNIRP), Guidelines on Limits of Exposure to Static Magnetic Fields, *Health Physics*, vol. 66, pp. 100-106. (Cited in para 5-4d.)

Section II

Related Publications

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

AR 11-2

Management Control

AR 11-34

The Army Respiratory Protection Program

AR 25-400-2

The Modern Army Recordkeeping System (MARKS)

AR 50-5

Nuclear Surety

AR 55-38

Reporting of Transportation Discrepancies in Shipments

AR 70-6

Type Classification of Army Materiel

AR 190-54

Nuclear Reactor Security Program

AR 210-10

Installations—Administration

AR 385-16

System Safety Engineering and Management

AR 700-64/DLAM 4145.8/NAVSUPINST 4000.34/AFR 67-8/MCO P4400.105

Radioactive Commodities in the DOD Supply Systems

AR 700-93

Processing and Shipping DOD Sponsored Retrograde Materiel Destined for Shipment to the United States, Its Territories, Trusts, and Possessions

AR 725-50

Requisitioning, Receipt, and Issue System

AST-1500Z-100-93

Identification Guide for Radioactive Sources in Foreign Materiel (This publication is available from Commander, U.S. Army Foreign Science and Technology Center, ATTN: IAFSTC-PO, 220 Seventh St. NE, Charlottesville, VA 22901-5396.)

DODI 6055.8

Occupational Radiation Protection Program

IEEE C95.1

Institute of Electrical and Electronics Engineers, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

NBS Handbook 107

Radiological Safety in the Design and Operation of Particle Accelerators (The National Bureau of Standards is now known as the National Institute of Standards and Technology) (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NBS Handbook 111

Radiation Safety for x-ray Diffraction and Fluorescence Analysis Equipment (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NBS Handbook 114

General Safety Standards for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NCRP Reports

Approximately 100 numbered reports on a variety of radiation safety topics (These publications may be obtained from the National Council on Radiation Protection and Measurements, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814.)

NRC Regulatory Guide 8.13

Instruction Concerning Prenatal Radiation Exposure (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NRC Regulatory Guide 8.29

Instruction Concerning Risks from Occupational Radiation Exposure (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

TB 43-0116

Identification of Radioactive Items in the Army

TB 43-0121

Inspection and Certification of RADIAC Meters (Dosimeters)

TB 43-0122

Instructions for the Safe Handling and Identification of U.S. Army Communications-Electronics Command-Managed Radioactive Items in the Army Inventory

TB 43-0216

Safety and Hazard Warnings for Operation and Maintenance of TACOM Equipment

TB 43-0133

Hazard Criteria for CECOM Radiofrequency and Optical Radiation Producing Equipment

TB 43-0137

Transportation Information for CECOM Radioactive Commodities (Use this bulletin for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

TB 43-0141

Safe Handling, Maintenance, Storage, and Disposal of Radioactive Commodities Managed by the U.S. Army Troop Support and Aviation Material Readiness Command

TB 43-180

Calibration and Repair Requirements for the Maintenance of Army Materiel

TB 385-4

Safety Requirements for Maintenance of Electrical and Electronic Equipment

TB MED 502

Respiratory Protection Program

TB MED 506

Occupational Vision

TB MED 521

Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma-Beam Equipment

TB MED 522

Control of Health Hazards from Protective Material Used in Self-Luminous Devices

TB MED 523

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

TB MED 524

Control of Hazards to Health from Laser Radiation

TB MED 525

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

Title 10, CFR, Part 835

Occupational Radiation Protection

TM 5-315

Transportability Guidance for Safe Transport of Radioactive Materials (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

TM 55-315

Transportability Guidance for Safe Transport of Radioactive Materials (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

TM 55-4470-400-12-1

Transportability Guidance for Nuclear Reactor Irradiated Fuel Elements (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

Section III

Prescribed Forms

DA Form 3337

Application for Army Radiation Authorization. (Cited in para 2-3b(1).)

Section IV

Referenced Forms

DA Form 11-2-R

Management Control Evaluation Certification Statement

DD Form 1952

Dosimeter Application and Record of Occupational Radiation Exposure

NRC Form 241

Report of Proposed Activities in Non-Agreement States

Appendix B
Sample application for Army Radiation Authorization (DA Form 3337)

APPLICATION FOR ARMY RADIATION AUTHORIZATION	
For use of this form, see AR 11-9; the proponent agency is DAS	
1 THIS IS AN APPLICATION FOR (Check appropriate item) <input type="checkbox"/> NEW ARA <input type="checkbox"/> AMENDMENT TO ARA NUMBER _____ <input type="checkbox"/> RENEWAL OF ARA NUMBER _____	2. NAME, MAILING ADDRESS, AND E-MAIL ADDRESS OF APPLICANT <i>(Include ZIP Code)</i>
3 ADDRESSES WHERE AUTHORIZED IONIZING RADIATION SOURCES WILL BE USED OR POSSESSED	
4 NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION	5 TELEPHONE NUMBER AND FAX NUMBER
Items 6 through 12 may be continued on the following page or on 8 1/2 x 11 paper. The type and scope of information to be provided should be adequate to show complete compliance with applicable regulations and guidance. <i>(If you can link use of radioactive material to a valid Nuclear Regulatory Commission (NRC) license, provide number and expiration date of the license and only submit documents that differ from the NRC license application and associated documents.)</i>	
6 RADIATION SOURCE(S)	
a RADIOACTIVE MATERIAL (Element and mass number, chemical and/or physical form, and maximum amount that you will possess at any one time.)	b ACCESSORIES AND X-RAY SYSTEM(S) CAPABLE OF PRODUCING HIGH RADIATION AREA OR VERY HIGH RADIATION AREA (Describe)
7. PURPOSE(S) FOR WHICH IONIZING RADIATION SOURCES WILL BE USED	8. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM THEIR TRAINING AND EXPERIENCE
9 TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS	10. FACILITIES AND EQUIPMENT (Describe rooms or areas, shielding, safety devices, monitoring equipment, and so on.)
11 RADIATION SAFETY PROGRAM	12 WASTE MANAGEMENT
13. CERTIFICATION	
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 all information contained in this application is true and correct to the best of their knowledge and belief.	
14 NAME, RANK, AND TITLE OF CERTIFYING OFFICER	15 SIGNATURE
	16. DATE (YYYYMMDD)

DA FORM 3337, MAY 1999

DA FORM 3337, MAR 80. IS OBSOLETE

URAPA V1 00

ITEMS 6 THRU 12 (Continued)

SAMPLE

PAGE 2, DA FORM 3337, MAY 1999

UCAPA V1.00

Appendix C Management Control Evaluation Checklist

C-1. Function

The function covered by this checklist is radiation safety.

C-2. Purpose

The purpose of this checklist is to assist commanders and radiation safety officers in evaluating the key management controls listed below. It is not intended to cover all controls.

C-3. Instructions

Answers must be based on the actual testing of key management controls (for example, document analysis, direct observation, sampling, simulation, other). Answers that indicate deficiencies must be explained and corrective action indicated in supporting documentation. These management controls must be evaluated at least once every five years. Certification that this evaluation has been conducted must be accomplished on DA Form 1122R (Management Control Evaluation Certification Statement).

C-4. Test questions

- a. If required (para 1-4k(1)), has a person been designated to be radiation safety officer?
- b. If required (para 1-4k(2)), has a written radiation safety SOP been established?
- c. Are all personnel occupationally exposed to radiation receiving appropriate radiation safety training?
- d. Are all radiation sources secured against unauthorized use and removal?
- e. If the unit possesses radioactive commodities, has a written SOP been established to assure compliance with radiation safety requirements of applicable technical publications?
- f. Are all controllable quantities of radioactive material and radiation-producing sources held by the unit under appropriate authority (for example, a Nuclear Regulatory Commission license, an Army radiation authorization, or as part of a radioactive commodity)?
- g. Is all radioactive waste disposed of properly?
- h. Are all radiation survey instruments used for health and safety appropriately calibrated?
- i. For Army laser ranges have all type-classified or commercial class IIIb or class IV lasers received appropriate evaluation before their use?
- j. Are all unwanted military-exempt lasers disposed of properly?
- k. Are all accidents and incidents involving excessive personnel radiation exposure or excessive radioactive contamination of facilities, equipment, or the environment promptly reported through appropriate channels?
- l. Do all personnel occupationally exposed to ionizing radiation or radioactive material above applicable levels (paras 5-2b(1) and c(1)) participate in an appropriate dosimetry or bioassay program?
- m. Is the dose in all unrestricted areas less than 2 millirems (0.02 millisieverts) in any one hour?

C-5. Supersession

This is a new checklist.

C-6. Comments

Help make this a better tool for evaluating management controls. Submit comments to HQDA (DACS-SF), WASH DC 20310-0200.

Glossary

Section I

Abbreviations

ACGIH

American Conference of Governmental Industrial Hygienists

ACSIM

Assistant Chief of Staff for Installation Management

ADR

automated dosimetry report

AFB

United States Air Force Base

AIRDC

Army Ionizing Radiation Dosimetry Center

ALARA

as low as is reasonably achievable

ALI

annual limit of intake

ANSI

American National Standards Institute

AR

Army Regulation

ARA

Army Radiation Authorization

ARP

Army Radiation Permit

ARSC

Army Radiation Safety Council

ASA(I&E)

Assistant Secretary of the Army (Installations and Environment)

BEI™

biological effectiveness index (ACGIH trademark)

Bkd

background

CDRR

Central Dosimetry Records Repository

CECOM

U.S. Army Communications-Electronics Command

CEDE

committed effective dose equivalent

CFR

Code of Federal Regulations

CG

Commanding General

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

cm
centimeter

DA
Department of the Army

DAC
derived air concentration

DASAF
Director of Army Safety

DOD
Department of Defense

DODI
Department of Defense Instruction

DOE
Department of Energy

dpm
disintegrations per minute

DOT
Department of Transportation

DSN
Defense Switching Network

EMR
electromagnetic radiation

EPA
U.S. Environmental Protection Agency

eV
electron volt

FY
fiscal year

GHz
gigahertz

GOCO
Government-owned contractor-operated

Gy
gray

h
hour

HHA
health hazard assessment

HQDA
Headquarters, Department of the Army

Hz
hertz

IAEA
International Atomic Energy Agency

ICNIRP
International Commission on Nonionizing Radiation Protection

IEEE
Institute of Electrical and Electronics Engineers

IR
infrared

kBq
kilobecquerel

kHz
kilohertz

km
kilometer

LSO
laser safety officer

m
meter

MACOM
major Army command

MARKS
Modern Army Recordkeeping System

METL
mission-essential task list

μCi
microcurie

mg
milligram

MIL-HDBK
military handbook

μm
micrometer

mm
millimeter

MOS
military occupational specialty

mrad
millirad

mSv
millisievert

MTF
medical treatment facility

NARM
naturally occurring or accelerated produced radioactive material

NBS
National Bureau of Standards (now named the National Institute of Standards and Technology)

NCRP
National Council on Radiation Protection and Measurements

NGB
National Guard Bureau

NIST
National Institute of Standards and Technology

nm
nanometer

NORM
naturally occurring radioactive material

NRC
U.S. Nuclear Regulatory Commission

NSN
National stock number

NVLAP
National Voluntary Laboratory Accreditation Program

OSHA
Occupational Safety and Health Administration

PHz
petahertz

RAM
radioactive material

RDTE
research, development, testing, and evaluation

RF
radiofrequency

RSC
radiation safety committee

RSO
radiation safety officer

RSSO
radiation safety staff officer

SB
supply bulletin

SI
Système Internationale (International System)

SOFA
status of forces agreement

SOP
standing operating procedure

SSI
specialty skill identifier

Sv

sievert

TACOM

U.S. Army Tank-Automotive and Armaments Command

TB

technical bulletin

TB MED

technical bulletin (medical)

TEDE

total effective dose equivalent

THz

terahertz

TLV™

threshold limit value (ACGIH trademark)

TM

technical manual

TMDE

test, measurement, and diagnostic equipment

TOE

table of organization and equipment

TSG

The Surgeon General

U.S.C.

United States Code

CHPPM

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

USAMC

U.S. Army Materiel Command

UV

ultraviolet

Section II

Terms

Absorbed dose

The energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).

Administrative dose

The total effective dose equivalent that a radiation safety officer assigns when dosimetry is inaccurate or has been misused or lost.

Agreement State

Any State with which the Atomic Energy Commission or the NRC has entered into an effective agreement in which the State assumes many of the NRC's functions.

ALARA

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

Annual limit of intake (ALI)

The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any organ or tissue.

Army regulation

A directive that sets forth missions, responsibilities, and policies, and establishes procedures to ensure uniform compliance with those policies.

Army Reserve facilities

Pertains to those facilities normally employed for the administration and training of Army Reserve units, in any entire structure or part thereof, including any interest in land, Army Reserve Center, and storage and other use areas.

Background radiation

Radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation. Background radiation does not include radiation from source, by-product, or special nuclear materials that the NRC regulates or from NARM that the Army regulates.

Becquerel (Bq)

The SI unit of radioactivity equivalent to one nuclear transformation per second.

Bioassay (radiobioassay)

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

Byproduct material

Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

Committed dose equivalent

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

Committed effective dose equivalent

The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

Commodity, radioactive

See Radioactive commodity

Condition

The status of personnel and equipment (readiness) as they interact with the operational environment during mission planning and execution.

Control

Action taken to eliminate hazards or reduce their risk.

Curie (Ci)

A unit of radioactivity equal to 37 billion becquerels.

Declared pregnant woman

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

Decommission

To remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the NRC license, Army reactor permit, or Army radiation authorization.

Deep-dose equivalent

Applies to external whole-body exposure and is the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm^2).

Derived air concentration (DAC)

The concentration of a given radionuclide in air that, if breathed for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an inhalation of one ALI.

Develop the Force

One of the Army's four core capabilities. This capability includes the processes of developing doctrine; developing requirements; acquiring, training and sustaining people; and identifying and developing leaders. This core capability encompasses the various functions that must be accomplished to create tactical units that comprise the Operational Force.

Deviation

A departure from the requirements of this regulation.

Direct and Resource the Force

One of the Army's four core capabilities comprised of four core processes: planning and policy development; direction and assessment; financial management; and information management. These processes have six functions: Leadership; Human Resource Management; Force Management; Military Strategy; Acquisition and Logistics Management; and Installations & Facilities Management.

Dose equivalent

The product of absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest in tissue. The units of dose equivalent are the rem and sievert (Sv).

Effective dose equivalent

The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated. The units of dose equivalent are the rem and sievert (Sv).

Electromagnetic radiation

Electric and magnetic fields that oscillate at right angles to each other and to their direction of propagation and that travel at the speed of light in a vacuum (300,000 kilometers per second). Electromagnetic radiation includes gamma rays, x rays, ultraviolet radiation, visible light, infrared radiation, radiofrequency radiation, and extremely low frequency electromagnetic radiation (see table 5-3).

Electron volt (eV)

A unit of energy equal to $1.6 \cdot 10^{-19}$ joule.

Exposure

In risk management, the frequency and length of time subjected to a hazard.

Extremely low frequency (ELF) electromagnetic radiation

Electromagnetic radiation with a frequency less than 3 kHz.

Eye dose equivalent

Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg cm^2).

Giga- (G)

An SI unit prefix indicating a factor of one billion (10^9).

Gray (Gy)

The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram (100 rads).

Hazard

Any real or potential condition that can cause injury, illness, death of personnel, damage to or loss of equipment or property, or mission degradation.

Hertz (Hz)

The SI unit of frequency equivalent to one vibration (cycle) per second.

High radiation area

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

Infrared (IR) electromagnetic radiation

Electromagnetic radiation with a wavelength between 760-780 nm and 1 mm.

Installation

A grouping of facilities located in the same vicinity, which support particular functions. Installations may be elements of a base. Land and improvements permanently affixed thereto which are under the control of the Department of the Army and used by Army organizations. Where installations are located contiguously, the combined property is designated as one installation and the separate functions are designated as activities of that installation. In addition to those used primarily by troops, the term installation applies to real properties such as depots, arsenals, ammunition plants (both contractor and Government operated), hospitals, terminals, and other special mission installations. For the purposes of this regulation, United States Army Regional Support Commands are installations.

Ionizing radiation

Charged subatomic particles and ionized atoms with kinetic energies greater than 12.4 eV, electromagnetic radiation with photon energies greater than 12.4 eV, and all free neutrons and other uncharged subatomic particles (except neutrinos and antineutrinos).

Kilo- (k)

An SI unit prefix indicating a factor of 1000.

Laser

A device that produces an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to lower energy levels. An acronym for light amplification by stimulated emission of radiation. Lasers are classified by degree of potential hazard (see 21 CFR 1040.10 and ANSI Z136.1 for comprehensive definitions of laser hazard classes).

- a. Class I lasers emit at levels that are not hazardous under any viewing or maintenance conditions. They are exempt from control measures. (However, as a matter of good safety practice avoid intrabeam viewing in case the laser is mislabeled.)
- b. Class II lasers (low-power) emit in the visible light portion of the electromagnetic spectrum. They are a potential eye hazard only for prolonged intrabeam viewing. Eye protection is normally afforded by the aversion response including the blink reflex.
- c. Class III (medium-power) lasers emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are a hazard for direct intrabeam and specular reflection viewing. Diffuse reflection is not normally a hazard.
 - (1) Class IIIa lasers, even though they emit at class III power levels, have special beam characteristics that make them eye-safe except when viewed through magnifying optics.
 - (2) Class IIIb lasers are all other class III lasers.
- d. Class IV (high-power) lasers emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are hazardous for direct intrabeam exposure and sometimes diffuse reflection exposure to the eyes or skin. They may also produce fire, material damage, laser-generated air contaminants, and hazardous plasma radiation.

Low-level radioactive waste

See Radioactive waste, low-level.

Materiel readiness command

A major subordinate command of the U.S. Army Materiel Command responsible for National Inventory Control Point (NICP) and National Maintenance Point (NMP) functions for assigned items (AR 725-50).

Member of the public

Any individual except when that individual is receiving an occupational dose.

Micro-(μ)

An SI unit prefix indicating a factor of one one-millionth (10^{-6}).

Military-exempt lasers

Those lasers and laser systems that the U.S. Food and Drug Administration has exempted from the provisions of 21 CFR 1040.10 and 1040.11 and of 21 CFR 1002 (except 21 CFR 1002.20) (exemption no. 76-EL-01 DOD). These laser products are used exclusively by DOD components and are designed for actual combat or combat training operations or are classified in the interest of national security.

Milli- (m)

An SI unit prefix indicating a factor of one one-thousandth (0.001).

Naturally occurring or accelerator produced radioactive material (NARM)

Radioactive material not classified as byproduct, special, or source material; NARM includes NORM (naturally occurring RAM).

Nonionizing radiation

Electromagnetic radiation with photon energies less than 12.4 eV

Occupational dose

The dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from regulated and unregulated sources of radiation, whether in the possession of the employer or other person. Occupational dose does not include dose received from background radiation; from any medical administration the individual has received; from exposure to patients administered radioactive material and released in accordance with applicable regulations; from voluntary participation in medical research programs; or as a member of the public.

Optical radiation

See Visible light.

Peta- (P)

An SI unit prefix indicating a factor of one million billion (10^{15}).

Probability

The likelihood that an event will occur.

Project the force

One of the Army's four core capabilities. This capability includes the processes of tailoring, mobilizing and projection of land power, and supporting organizational training. Recognized as the overriding capability by which the Army will be measured is the ability to rapidly deploy ready forces into a distant area of operations and keep them coming as dictated by the tempo of battle.

Qualified expert

A person who, by virtue of training and experience, can provide competent authoritative guidance about certain aspects of radiation safety. Being a qualified expert in one aspect of radiation safety does not necessarily mean that a person is a qualified expert in a different aspect. Forward requests for determination of whether a certain individual is a qualified expert through command channels to the MACOM RSSO as necessary. Forward these requests to HQDA (DACS-SF), WASH DC 20310-0200, for further evaluation as necessary.

Quality factor

The modifying factor [listed in 10 CFR 20.1004, tables 1004(b).1 and 1004(b).2] that is used to derive dose equivalent from absorbed dose.

Rad

A unit of absorbed dose. One rad is equal to an absorbed dose of 0.01 joule/kilogram (0.01 gray).

Radiation

For the purposes of this regulation, unless otherwise specified, radiation includes both ionizing and nonionizing radiation.

Radiation area

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

Radiation safety

For the purposes of this regulation, a scientific discipline whose objective is the protection of people and the environment from unnecessary exposure to radiation. Radiation safety is concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived. Same as *health physics and radiation protection*.

Radiation safety committee

An advisory committee for the commander to assess the adequacy of the command's radiation safety program. Same as *radiation control committee and radiation protection committee*.

Radiation Safety Officer

The person that the commander designates, in writing, as the executive agent for the command's radiation safety program. Same as *radiation protection officer or health physics officer*.

Radiation safety program

A program to implement the objective of radiation safety.

- a. The Army's radiation safety program includes all aspects of:
 - (1) Measurement and evaluation of radiation and radioactive material pertaining to protection of personnel and the environment.
 - (2) Army compliance with Federal and DOD radiation safety regulations.
 - (3) The Army's radiation dosimetry, radiation bioassay, radioactive waste disposal, radiation safety training, and radiation instrument TMDE and calibration programs.
- b. A command's radiation safety program includes all aspects of:
 - (1) Measurement and evaluation of radiation and radioactive material within the command as they pertain to protection of personnel and the environment.
 - (2) Compliance with Federal, DOD, and Army radiation safety regulations.

Radioactive commodity

An item of Government property made up in whole or in part of radioactive material. A national stock number (NSN) or part number is assigned to commodities containing radioactive material greater than 0.01 Ci.

Radioactive waste

Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act, as amended, or is of sufficient quantity to require an Army radiation authorization, and is of negligible economic value considering the cost of recovery.

Radioactive waste, low-level

Material the NRC classifies as low-level radioactive waste (see 10 CFR 62.2); waste not classified as high-level radioactive waste (spent nuclear fuel), as transuranic waste, or as uranium or thorium tailings and waste; material acceptable for burial in a land disposal facility (10 CFR 61).

Radiobioassay

See bioassay.

Radiofrequency (RF) electromagnetic radiation

Electromagnetic radiation with frequencies between 3 kHz and 300 GHz.

Radiofrequency (RF) controlled environment

Locations where RF exposure may be incurred by persons who are aware of the potential for occupational exposure, by other cognizant persons, or as the incidental result of transient passage through areas where analysis shows the exposure levels may be above those shown in DODI 6055.1, table 6-2-1, but do not exceed those shown in DODI 6055.1, table 6-1-1. Existing physical arrangements or areas, such as fences, perimeters, or weather deck(s) of a ship may be used in establishing a controlled environment.

Radiofrequency (RF) uncontrolled environments

Locations where RF exposures do not exceed permissible exposure levels in DODI 6055.1, table 6-2-1. Such locations generally represent living quarters, workplaces, or public access areas where personnel would not expect to encounter higher levels of RF energy.

Recorder, RSC

The person directly responsible for the accuracy and completeness of the RSC minutes. The recorder may designate someone else to take notes at RSC meetings (for example, an assistant or secretary). The recorder should be the RSO to help assure that the minutes meet regulatory requirements.

Rem

A unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 sievert).

Residual Risk

The level of risk remaining after controls have been identified and selected for hazards that may result in loss of combat power. Controls are identified and selected until residual risk is at an acceptable level or until it cannot be practically reduced any further.

Risk

Chance of hazard or bad consequences; exposure or chance of injury or loss. Risk level is expressed in terms of hazard probability and severity.

Risk assessment

The identification and assessment of hazards (first two steps of the risk management process).

Risk decision

The decision to accept or not accept the risk(s) associated with an action; made by the commander, leader, or individual responsible for performing that action.

Risk management

A logical five step thought process, applicable to any situation or environment, for identifying and controlling hazards to protect the force.

Risk management integration

The process by which individuals or organizations develop plans to embed risk management into all that they do.

Severity

The expected consequence of an event in terms of degree of injury, property damage, or other mission impairing factors (loss of combat power, adverse publicity, and so on), that should occur.

Shallow dose equivalent

Applies to the external exposure of the skin or an extremity and is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg cm^{-2}) averaged over an area of 1 square centimeter.

Sievert (Sv)

The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor ($1 \text{ Sv} = 100 \text{ rem}$).

Source material

Uranium or thorium, or any combination thereof, in any physical or chemical form or ores that contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

Special nuclear material

Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, or any material artificially enriched by any of the foregoing.

Sustain the Force

One of the Army's four core capabilities. This capability includes the processes of acquiring, maintaining and sustaining equipment; maintaining and sustaining land operations; acquiring and sustaining infrastructure and operating installations.

Tera- (T)

An SI unit prefix indicating a factor of one trillion (10^{12}).

Total effective dose equivalent

The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Type classification

A designation the Army uses to indicate acceptability for service use (AR 70-61).

Ultraviolet (UV) electromagnetic radiation

Electromagnetic radiation with wavelengths between 100 nm and 380-400 nm.

United States Army Reserve Center

A home station facility, activity, or installation utilized for administration and training of United States Army Reserve units and personnel.

Unrestricted area

An area, access to which is neither limited nor controlled (for the purposes of ionizing radiation safety).

Very high radiation area

An area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from a radiation source or from any surface that the radiation penetrates.

Visible light

Electromagnetic radiation with wavelengths between 380-400 nm and 760-780 nm.

Weighting factor

For an organ or tissue, the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly.

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Item 10.6

AR 40-5

**Preventive Medicine
Chapter 9, Radiation Protection**

Army Regulation 40-5

Medical Services

Preventive Medicine

**Headquarters
Department of the Army
Washington, DC
15 October 1990**

UNCLASSIFIED

SUMMARY of CHANGE

AR 40-5
Preventive Medicine

This revision--

- o Consolidates AR 40-5, AR 40-26, and AR 40-554.
- o Adds Responsibilities for commanders (chaps 1, 9, and 12) and preventive medicine personnel (chaps 1, 2, 4,5,6, and).
- o Adds information on the Preventive Dentistry Program, community health nursing activities, disease and climatic injury prevention and control, medical examinations, spirometry surveillance, community and family health, nonionizing radiation registry, sanitation, and field preventive medicine (chaps 2, 3, 4, 5, 6, 9, 12, and 14).
- o Deletes the appendix on ice manufacture sanitation in AR 40-5.
- o Rescinds RCS MED-292 (DA Form 3898-R (Report of Tuberculosis Detection and Control)).
- o Adds DD Form 2493-1 (Asbestos Exposure, Part I--Initial Medical Questionnaire).
- o Adds DD Form 2493-2 (Asbestos Exposure, Part II-Periodic Medical Questionnaire).
- o Adds DA Form 3897-R (Tuberculosis Registry).
- o Adds DA Form 5931 (Occupational Health Patient Form).
- o Adds DA Form 5932 (USAREUR Occupational Health Form).
- o Adds DA Form 5933 (Occupational Health Patient Form-Supplemental).
- o Adds DA Form 5934 (Korea Occupational Health Encounter Form).
- o Adds DA Poster 40-5 (Lyme Disease Warning).

Effective 14 November 1990

Medical Services

Preventive Medicine

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:



MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army

History. UPDATE printing of November 1990 published a revision of this publication. This publication has been reorganized to make it compatible with the Army electronic publishing database. No content has been changed.

Summary. This regulation is a consolidation of several regulations that cover the Army's preventive medicine program. It establishes practical measures for the preservation and promotion of health and the prevention of disease and injury. This regulation implements Executive Order 12196 and DOD Instructions 6050.5, 6055.1, 6055.5, and 6055.12.

Applicability. This regulation applies to facilities controlled by the Army and to all elements of the Army. This includes military

personnel on active duty; U.S. Army Reserve or Army National Guard personnel on active duty or in drill status; U.S. Military Academy cadets; U.S. Army Reserve Officer Training Corps cadets, when engaged in directed training activities; foreign national military personnel assigned to Army components; and civilian personnel and nonappropriated fund employees who are employed by the Army on a worldwide basis.

Army management control process. This regulation is subject to the requirements of AR 11-2. This regulation contains internal control provisions but does not contain checklists for conducting internal control reviews. These checklists are contained in DA Circular 11-88-7.

Supplementation. Supplementation of this regulation by the principal HQDA officials and major Army commands listed below is permitted. Supplementation is prohibited by all other elements without prior approval of HQDA (SGPS-PSP), 5109 Leesburg Pike, Falls Church, VA 22041-3258. If supplements are issued, one copy of each will be

furnished to HQDA (SGPS-PSP), 5109 Leesburg Pike, Falls Church, VA 22041-3258.

- a. Office of the Chief of Engineers.
- b. National Guard Bureau.
- c. Office of the Chief, Army Reserve.
- d. U.S. Army Training and Doctrine Command.
- e. Forces Command.
- f. U.S. Army Health Services Command.
- g. U.S. Army Materiel Command.
- h. U.S. Army, Europe.
- i. Eighth U.S. Army.
- j. U.S. Army South.

Interim changes. Interim changes to this regulation are not official unless they are authenticated by the Administrative Assistant to the Secretary of the Army. Users will destroy interim changes on their expiration dates unless sooner superseded or rescinded.

Suggested improvements. The proponent agency of this regulation is the Office of The Surgeon General. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA (SGPS-PSP), 5109 Leesburg Pike, Falls Church, VA 22041-3258.

Distribution. Distribution of this publication is made in accordance with the requirements on DA Form 12-09-E, block number 2058, intended for command level C for Active Army, Army National Guard, and U.S. Army Reserve (applicable to all Army elements); and command level A for Active Army and Army National Guard and D for U.S. Army Reserve (applicable to medical activities only).

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RESERVED

APPLICATION FOR ARMY RADIATION AUTHORIZATION OR PERMIT
 For use of this form, see AR 11-9; the proponent agency is DASAF.

1. THIS IS AN APPLICATION FOR (Check appropriate item) <input type="checkbox"/> a. NEW ARA/ARP <input type="checkbox"/> b. AMENDMENT TO ARA/ARP NUMBER _____ <input type="checkbox"/> c. RENEWAL OF ARA/ARP NUMBER _____		2. NAME AND MAILING ADDRESS OF APPLICANT (Include ZIP code)	
3. ADDRESS(ES) WHERE AUTHORIZED IONIZING RADIATION SOURCE(S) WILL BE USED OR POSSESSED			
4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION			5. TELEPHONE NUMBER
SUBMIT ITEMS 6 THROUGH 12 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED SHOULD BE ADEQUATE TO SHOW COMPLETE COMPLIANCE WITH APPLICABLE REGULATIONS AND GUIDANCE. (IF YOU CAN LINK USE OF RADIOACTIVE MATERIAL TO A VALID NUCLEAR REGULATORY COMMISSION (NRC) LICENSE, PROVIDE NUMBER AND EXPIRATION DATE OF THE LICENSE AND ONLY SUBMIT ITEMS THAT DIFFER FROM THE NRC LICENSE APPLICATION AND ASSOCIATED DOCUMENTS.)			
6. RADIATION SOURCE(S) a. RADIOACTIVE MATERIAL : b. ELECTRICAL RADIATION SOURCE:			
7. PURPOSE(S) FOR WHICH IONIZING RADIATION SOURCE(S) WILL BE USED.		8. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE	
9. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.		10. FACILITIES AND EQUIPMENT (describe rooms or areas, shielding, safety devices, monitoring equipment, and so on).	
11. RADIATION SAFETY PROGRAM.		12. WASTE MANAGEMENT.	
13. CERTIFICATION. 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 ALL INFORMATION CONTAINED IN THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.			
14. NAME, RANK, AND TITLE OF CERTIFYING OFFICER		15. SIGNATURE	16. DATE

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DETACH INSTRUCTIONS BEFORE SUBMITTING APPLICATION

INSTRUCTIONS FOR PREPARING DA FORM 3337

GENERAL INSTRUCTIONS

An applicant for an Army Radiation Authorization (ARA) or Permit (ARP) should complete DA form 3337, May 99 edition, in detail. The completed form will be submitted through channels to the higher headquarters Safety Office.

For USAREUR units forward the application to:

USAREUR ODCS G1
HQ USARER & 7A
ATTN: AEAGA-S (Safety Division),
Unit # 29351
APO AE 09014.

For IMA-E units, forward the application to:

Installation Management Agency-
European Region,
ATTN: SFIM-EU-ZS
Unit 29353
APO AE 09014

If this is an initial application complete items 1 thru 16 of DA form 3337. For a renewal or amendment application the information provided for items 6 thru 10

contained in previous applications filed with the higher headquarters Safety Office may be included by reference provided references are clear and specific and applicable.

Use supplemental sheets when necessary to provide complete information. Items 11 through 16 must be completed on all applications.

Ensure that all applications are complete and detailed. Submitting an incomplete application will result in a delay in issuing the ARA or ARP.

After the application is reviewed and approved by the Army in Europe Radiation Safety Council, a letter will be prepared in accordance with AR11-9 *The Army Radiation Safety Program* for signature by the higher headquarters commander or director. The signed letter then becomes your Army Radiation Authorization (or Permit).

SPECIAL INSTRUCTIONS

ITEM 1. Check the appropriate box to indicate whether application is for a new ARA or ARP, an amendment, or a renewal. Line out unneeded initials.

ITEM 2. The applicant is the organization legally responsible for possession and use of the radiation source(s) requested in the application.

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ITEM 3. Indicate the address where the radiation source(s) will be used or stored if different from that listed in item 2. If it is the same as item 2, state same as Item 2. Note: a Post Office box address is not acceptable. If the source is to be used throughout an area of operations, state that in this block.

ITEM 4. The name of the person to be contacted about this application is the person completing the form who can answer questions about the information contained in the application package.

ITEM 5. The telephone number is the telephone number of the individual listed in item 4.

ITEM 6. When applying for use of radioactive material, list by name each radioactive material needed by element and mass number, e.g. Am-241. List its chemical and physical form, e.g. solid CsCl powder, and list the maximum quantity needed by the applicant in millicuries (or becquerels), e.g. 10 millicuries (370 MBq), and principal radiation emitted.

EXAMPLE 6-a:

Cs-137, Cs metal, 10 mCi (370 MBq), gamma emitter.

If more than one chemical or physical form of a radioactive material is needed, a separate possession limit will be requested for each form.

EXAMPLE 6-b:

Ra-226, Ra Sulphate, 10 mCi (370MBq), gamma emitter

Ra-226, Ra-Beryllium powder, 5 mCi (185 MBq), neutron emitter.

If the radioactive material is to be obtained in sealed source(s), also specify the amount of activity in each sealed source, the manufacturer's name, and the model number.

EXAMPLE 6-c:

a. Am-241, Americium-Beryllium powder, 5 sources, 40 mCi per source, 200 mCi total, (Troxler, Model 47), neutron emitter.

b. Cs-137, cesium chloride powder, 5 sources, 8 mCi per source, 40 mCi total (Troxler, Model CC), gamma emitter.

If electrically generated sources are requested, list the electrical devices by type and parameters at maximum rated voltage and amperage.

EXAMPLES 6-d:

a. LORAD industrial x-ray, 160 KVP, 6.6 mA, 22.5 Rem/minute at one meter, x-ray machine.

b. Rapiscan Model 522B package scanner, 110 KVP, 2 MA, 0.1 mRem/hr contact, luggage x-ray machine.

ITEM 7. State the use of each radioactive material or machine requested in item 6. For example, Measure soil moisture and density during road construction and facility construction. Or, for non-destructive inspection of aircraft.

ITEM 8. On the ARA application enter the name and phone number of the RSO. On a separate sheet of paper, enter the

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name of the ARS) and the information requested below. Attach it to the application form.

For the RSO and alternate RSO provide the following:

a. A synopsis of their radiation safety training: when and where they were trained and the duration of the training in the following areas: (a) the principles and practices of radiation safety, (b) radioactivity measurement, (c) radiation instrument use, (d) mathematics and calculations basic to the use of radiation, and (e) the biological effects of radiation. Indicate for each course whether it was formal training or on-the-job (OJT) training.

b. A synopsis of their radiation safety officer experience: (a) the isotopes and machinery over seen, (b) the quantities monitored, (c) when and where the experience was gained, (d) the duration of the experience, and (e) the type of operation (industrial, medical, R&D, etc).

c. Include any additional certifications held by the safety officers, e.g., if the RSO is certified under a certification program such as NAS 410 NDI Certification program or by the National Registry of Radiation Protection Technologist, please provide certification certificates and information.

d. Attach copies of training certificates, and any other qualification documents for the RSOs.

e. Attach appointment orders for the RSO and alternate RSO.

ITEM 9. Training and Experience.

a. For the operators, list their name, a synopsis of their radiation safety training and operational experience with the equipment to be operated, and any other job related requirements such as possessing an SSI of N2 for LORAD operators. Include training certificates and certification documents.

b. Include information regarding radiation safety training to be conducted by the RSO: (a) training for non-operator personnel and (b) operator training during use of the equipment. Examples of RSO provided training are annual operator refresher training (if required), general awareness training for unit members not operating the equipment, and necessary supplemental training such as hazmat transportation training. Include the frequency with which training is to be conducted.

ITEM 10. This item is for identifying the equipment and facilities needed to safely operate the requested radiation source. In this item list the equipment used, and any general work and storage area requirements.

a. Clearly identify by make, model, and serial number the equipment containing radioactive material or electrically produced ionizing radiation source. Pictures, drawings, and diagrams are needed to help reviewers identify the equipment. The information needs to be in sufficient detail to allow identification equipment hazards by personnel not trained in its use.

b. Identify the kinds of safety survey instruments to be used by make and model, the number of instruments available, the radiation detected by the instrument, the instrument sensitivity in

$\mu\text{Sv/hr}$ (or mrem/hr), and the intended use of each meter model (survey or monitor). NOTE: For health and safety purposes instruments must be calibrated as ACTIVE. (Active means the instrument is calibrated annually with a maximum error of $\pm 10\%$ of the actual reading).

EXAMPLE 10a:

AN/VDR-2 with a DT-616 beta-gamma probe, 2 each, $0.01\mu\text{Gy/hr}$ to 999 Gy/hr , ACTIVE, used to survey work area and evaluate public dose rates.

NOTE: It is recommended that at least three meters be available in case one fails. With three meters, one can be in calibration and two for use at the unit. Calibration dates must be staggered to ensure enough meters are available to operate at all time.

Tactically calibrated meters (meters calibrated every 3 years to $\pm 30\%$ of the meter reading) are intended for wartime use and cannot be used for peacetime health and safety purposes.

c. Identify who will calibrate the meters and the calibration frequency. For the Army in Europe, this will be the Army TMDE Group located in Pirmasens through the local TMDE centers.

d. If TLDs are required, state what kind of TLD will be used (whole body, extremity, natal, etc.) and who will supply them. Army personnel (military and civilian) will use TLDs issued by the US Army Ionizing Radiation Dosimetry Branch, Redstone Arsenal, AL. For contractor personnel, other dosimetry providers may be used as specified by contracting.

e. Describe the general layout of the work area including a diagram of safety controls (such as roped off areas), posting requirements, any monitors required, and any other precaution needed to maintain worker and public safety.

f. Identify storage requirements such as a locked cabinet, imposed storeroom controls such as a marked exclusion area, radiation signs, and any personnel occupancy restrictions.

g. State how you are going to impose radiation safety control over outdoors work areas if they are needed--roped off work areas, monitors with hand-held radios, flashing lights, etc.

Item 11. The radiation safety program cited is the commander's written radiation safety program authorizing use of the requested radiation equipment. Reference the document title and date here in Item 11. Attach a copy of the completed document to the application. The radiation safety program may be an annex to the unit safety SOP or may be a separate standalone document as the commander wishes. A sample SOP can be found at the following web-address.

www.per.hqusareur.army.mil --> safety --> radiation -->SOP

The SOP is downloadable and is in Microsoft Word format. It is provided as a template to assist you in preparation of your SOP.

Item 12. Enter "Radioactive waste will not be generated." Unwanted, unneeded, or damaged equipment will be sent to Pirmasens IAW SOP 700-48 for processing and return to the United

States. (A downloadable version of SOP 700-48 is found at the web site cited in Item 11.) The SOP contains names, addresses, and phone numbers to assist in moving your equipment to Pirmasens.)

a. No equipment containing radioactive material may be buried on Army property, sent to the Defense Reutilization and Marketing System, or sent to a commercial landfill for disposal.

b. Unusable equipment will be turned in after coordination with the Radioactive Material Processing Facility Manager, Pirmasens, Germany. See SOP 700-48 for details.

c. Useable chemical agent detectors and chemical agent monitors will be returned to the supply system, after coordination with the NBC Equipment Group, Unit and Soldier Equipment Branch, 200th Material Management Center, DSN: 794-7364. Other equipment will be returned after coordination with the local property book officers for reuse in theater or elsewhere in DoD.

iv. Disposal of serviceable Commercial-Off-The-Shelf equipment, such as Troxlers and Vapor Tracers, will be arranged by the applicant. Disposal of machines producing ionizing radiation will be in accordance with environmental law and DRMS procedures. For COTS equipment

containing radioactive material, the first disposal option to pursue is return of the equipment to the manufacture for reuse. This should be part of the purchase contract. The last disposal option is to coordinate with Radioactive Material Processing Facility, Pirmasens, and transfer the equipment to them.

Item 13. Keep as is.

Item 14. Enter the data for the commander of the unit preparing the application.

Item 15. Once the application is complete, have the commander sign the document.

Item 16. The date the document is signed.

AFTER COMPLETING ALL NECESSARY ACTIONS AND PROVIDING ALL REQUESTED INFORMATION, forward the application to the appropriate safety office cited in the General Instructions.

that health education programs are not intended to replace the patient-practitioner relationship and individual counseling.

c. Furnish a comprehensive service within the MEDCEN or MEDDAC to educate patients to assume maximum responsibility for their treatment and health maintenance applicable to their condition. Appropriate behavioral modification will improve management and reduce dependence on the MTF.

7-3. Functions

a. TSG will provide consultation and assistance to commanders in planning and implementing programs of health information and health education.

b. MEDCEN and MEDDAC commanders will encourage and promote health information and education programs by programming resources for the development of such programs.

c. Chief, DPCCM, in coordination with chief, PVNTMED service, will plan, develop, implement, and evaluate programs of health information for the community and health education for the patient. The extent and the effectiveness of the program will depend on the resources obtained and resourcefulness of the personnel.

Chapter 8 Medical Safety

8-1. General

This chapter contains—

a. The practices and procedures that govern the accomplishment of a safety program in Army MTFs and that supplement Army safety regulations in the AR 385-series.

b. Guidance for medical commanders, MTF safety personnel, supervisors, PVNTMED personnel, OH personnel, and hospital engineering and/or maintenance personnel to provide a safe and healthful environment for the staff, patients, and visitors in an MTF.

8-2. Army Medical Department unit safety

a. Safety program management functions and responsibilities for MEDDACs and MEDCENs are the same as for all units as prescribed in AR 385-10.

b. Accident reporting and recordkeeping procedures and responsibilities are defined in AR 385-40.

8-3. Hospital safety

a. The hospital commander has overall responsibility for safety in the hospital. However, all personnel who are employed in an MTF must be involved in an active safety program.

b. An SOH advisory council committee will be organized with representation from the administration, PVNTMED service, medical staff, nursing staff, engineering and maintenance, housekeeping, and nutritional care. The committee will meet regularly and keep written minutes of its meetings. The findings of the committee and appropriate recommended corrective actions will be reported in the committee minutes and all minutes will be signed and approved by the commander.

c. The hospital will have written safety policies to include procedures for safety of patients and accident reporting procedures.

d. A safety officer or safety manager will have authority defined in writing to act upon hazardous conditions within the hospital.

e. A safety orientation program will be provided for all new employees. Ongoing safety education will be provided by the supervisor for all employees and will be documented. Educational programs will be developed for specific areas and activities within the hospital. All employees will be instructed by their supervisors as to the hazards inherent in their jobs and the safety rules pertaining to their specific duties. Education related to job hazards will be coordinated with OH personnel, the safety manager or officer, and the infection control nurse, when appropriate.

f. The hospital will have a written policy that prohibits smoking in the hospital or permits smoking only in designated areas. As a

minimum, smoking will be controlled to protect the rights of non-smokers from secondhand smoke. Smoking will be specifically prohibited in patient care areas, laboratories (including dental labs), darkrooms, supply rooms, pharmacies, dining facilities, snack bars, hospital exchanges, storage rooms, medical supply warehouses, material distribution supply areas, mechanical rooms, stairways, locker rooms, and where flammable and combustible liquids, and flammable gases and oxygen are used or stored.

8-4. Medical systems safety and health

a. Hazards.

(1) Significant safety and health exposures that are unique to treatment facilities can affect patients, visitors, and staff with potentially lethal consequences.

(2) PVNTMED service personnel will develop a close working relationship with the MEDDAC safety officer or manager and engineering and maintenance personnel to coordinate the identification and elimination of hazards. Refer to USAEHA TG No. 152 for additional guidance.

b. Fixed facilities.

(1) Electrical safety requirements are defined in the Accreditation Manual for Hospitals (AMH), Joint Commission on Accreditation of Healthcare Organizations (JCAHO); the National Fire Prevention Association (NFPA) Standards 70 and 99; and 29 CFR 1910.

(2) Fire safety requirements are defined in the AMH, JCAHO; NFPA Standards; and 29 CFR 1910.

(3) General safety requirements are defined in the AMH, JCAHO; 29 CFR 1910; and the AR 385-series.

(4) Environmental health requirements are defined in TB MED 2, the AMH, JCAHO; and chapters 4 (sec III), 11, 12, and 14 of this regulation.

(5) Industrial hygiene requirements are defined in TB MEDs 6, 266, 501, 502, 503, and 510; NIOSH Publications 75-137, 77-140, 77-171, and 77-200; and 29 CFR 1910.

c. *Field operations.* Until definitive military-unique safety criteria for field operations and mobile facilities are issued, every attempt should be made to comply with the intent of codes and standards for fixed facilities (b above).

Chapter 9 Radiation Protection

9-1. General

a. The Army radiation protection program is directed towards safeguarding personnel from unnecessary exposure to ionizing and nonionizing radiation. The program is based on—

(1) Control of radiation sources.

(2) Control of personnel.

(3) Monitoring and education of personnel.

(4) Measurements of radiation emissions.

(5) Medical examinations to detect evidence of changes due to radiation.

b. Protection depends on exercise of command authority, individual compliance, and an organization specifically devoted to radiation protection.

9-2. Purpose

This chapter prescribes the methods for the control of potential health hazards resulting from the procurement, possession, storage, transportation, use, and disposal of radioactive materials or equipment capable of producing potentially hazardous ionizing or nonionizing radiation. This chapter is not intended to conflict with or supersede established procedures for radiological defense.

9-3. Goal

The two radiation protection primary goals are to minimize the—

a. Ionizing radiation exposure (individual and collective) to as low as reasonably achievable (AR 40-14/DLAR 1000.28).

b. Release of radioactive effluents into the environment (AR 200-1).

9-4. Organization

a. *Radiation control committee.* AR 40-14/DLAR 1000.28, AR 385-11, and TB MED525 prescribe the requirements for the composition and responsibilities of the radiation control committee. The radiation control committee should also advise the commander on nonionizing radiation hazards and methods to control these hazards.

b. *Radiation protection officer.*

(1) The commander will designate (in writing) an RPO and an alternate RPO whose primary duties are to manage the radiation protection program. The RPO will be provided training, equipment, and a support staff commensurate with the extent of his or her responsibilities. The RPO will be responsible for managing the ionizing radiation protection requirements specified in AR 40-14/DLAR 1000.28, AR 385-11, and TB MED 525 as well as the Nonionizing Radiation Protection Program (AR 40-46 and USAEHA TG No. 153). Complete program files should be maintained by the RPO to include the current records of inventory, SOPs, and records of related safety instruction.

(2) Medical activities with nuclear medicine services require a full-time RPO qualified under TB MED 525.

9-5. Medical surveillance

a. Personnel potentially exposed to ionizing radiation in their occupational environment will receive medical examinations as required by AR 40-14/DLAR 1000.28.

b. Personnel potentially exposed to nonionizing radiation will receive medical examinations as required by AR 40-46, TB MED 523, TB MED 524, and USAEHA TG No. 153.

9-6. Personnel dosimetry

a. *Ionizing radiation.*

(1) The DA policies regarding ionizing radiation exposure standards, the use of personnel dosimeters, and the recording of occupational exposure to ionizing radiation are specified in AR 40-14/DLAR 1000.28.

(2) Bioassay procedures will be performed when radioactive materials are used in such a manner that they could be inhaled, ingested, or absorbed into the body (AR 40-14/DLAR 1000.28).

(a) The necessity, frequency, and methodology for performing bioassay procedures will depend on the radionuclide(s), their chemical and physical form, and the amount of material potentially available for entry into the human body (AR 40-14/DLAR 1000.28).

(b) Unless prescribed elsewhere the type of analysis and the frequency of the bioassay procedure will be determined by the IMA in consultation with the RPO.

(c) Bioassay services are available from the Commander, USAEHA, ATTN:HSBH-ML-R, Aberdeen Proving Ground, MD 21010-5422. Specimens should be sent directly to USAEHA. Do not send the specimens through command channels. Each specimen should be accompanied by a properly completed laboratory form (SF 557(Miscellaneous)). The following information, in addition to the data normally entered on laboratory forms, is required in the remarks block to enable USAEHA to evaluate the internal exposure from radioactive material:

1. Possible exposure date and time (if known), in case of acute exposure.

2. Duration of exposure, in case of chronic exposure.

3. Chemical and physical form of radionuclide and suspected activity involved.

4. Suspected route of entry.

5. Any additional information concerning the situation that prompted the request (if necessary, on a separate sheet or consultation sheet(SF 513,(Medical Record—Consultation Sheet)).

(3) All actual or alleged overexposures to ionizing radiation will be investigated and reported under AR 40-14/DLAR 1000.28 and AR 385-40.

(4) The RPO will calculate the collective exposure to ionizing

radiation of all persons for which a DD Form 1141 is maintained. This calculation will include the most recent 3 months of reported exposures.

(5) The RPO will report quarterly the following information to the radiation control committee:

(a) Collective exposure: Person-roentgen equivalent man(person-rem) in a quarter. (Person-rem is calculated by adding all exposures during a quarter.)

(b) Average exposure: rem/quarter. (Rem/quarter is obtained by dividing person-rem by the total number of persons monitored.)

(c) Highest exposure: rem.

b. *Nonionizing radiation.* No suitable personnel dosimeters are available.

9-7. Protective clothing and equipment

a. *Ionizing radiation.*

(1) Concentrations of airborne radioactive materials located in the breathing zone of radiation workers will not exceed concentrations as specified in 10 CFR 20.103 without adequate respiratory protection (TB MED 502).

(2) Protective clothing and respiratory protective equipment may be required to minimize the exposure of the worker. When required, such equipment and clothing will be identified for control purposes. (See AR 385-10 and AR 385-32.)

(3) Adequate respiratory protection programs will be established to assure that equipment appropriate to the potential hazard is selected, used, and maintained (TB MED 502). The use of respiratory protection is not a suitable substitute for proper ventilation, containment, and process controls, and will not be used in place of other feasible engineering controls.

(4) A respirator that is not used routinely, but maintained ready for emergency use, will be inspected after each use and at least monthly to assure that it is in satisfactory operating condition (TB MED 502). A record will be maintained of inspection dates and findings (AR 25-400-2).

(5) When laboratory hoods are used to maintain minimum levels of airborne radioactive material in work or storage areas, the airflow in the hood will have an average velocity of at least 100 linear feet per minute(fpm) (30 meters/minute (m/min)) plus-or-minus 10 percent through the fully open face. Glove box hoods must have an inward average velocity of 50 fpm through doors/ports or 0.25 inch static pressure on a closed system. Hoods should be provided with a dual speed fan to permit operation at a higher velocity while the hood is in use and at a lower velocity when it is closed. Bypass openings will be provided to maintain proper hood and room pressure balance. The variations in air velocity through the open face will not exceed plus-or-minus 20 percent. Each hood will have an independent exhaust system with the fan installed outside the building or at the point where the exhaust leaves the building to ensure that the duct work inside the building is under negative pressure. The point of discharge should be at least 10 feet (3.1 m) above the roof and 100 feet (31 m) from any air intake to minimize radioactive effluents being carried back into the same or adjacent buildings. The fan should discharge into a vertical stack with no directional baffles or projections (TM 5-810-1).

(6) Laboratory hoods should be evaluated and flow measurements made at least semiannually. Documentation of such measurements will be maintained under AR 25-400-2.

b. *Nonionizing radiation.* PPE is only used when other control measures do not provide adequate protection. TB MED 524 provides guidance for the proper use and marking of laser eye protectors.

9-8. Radiation detection and measuring equipment

a. *Ionizing radiation.*

(1) All radiation protection survey instrumentation for health and safety monitoring of radiation sources will be calibrated at the frequency specified in TB 750-25.

(2) All pocket dosimeters used for health and safety purposes will be calibrated, inspected, and certified.

(3) Radiation protection survey instrumentation will have a DA

Label 80 (U.S. Army Calibrated Instrument) placed in a conspicuous location indicating the date the instrument was calibrated as specified in DA Pam 738-750. Energy dependence and any necessary correction factors should be provided with the calibration data.

(4) Faulty radiation protection survey instrumentation will be tagged with a DA Form 2417 (U.S. Army Calibration System Rejected Instrument) to avoid use before being repaired (DA Pam 738-750).

(5) The operational status of all radiation protection survey instrumentation will be verified before removal of shielding from a radiation source or entering a known or suspected radiation field.

(6) All radiation measuring equipment used with nuclear medicine procedures will be calibrated as specified in TB MED 525.

(7) All dosimetry systems used in the calibration of therapeutic x-ray and gamma-beam equipment will be calibrated as specified in TB MED 521.

b. Nonionizing radiation. Other than the use of recommended instrumentation for the measurement of microwave oven leakage, the instrumentation required to adequately assess the hazards of high intensity ultraviolet, infrared, visible, ultrasound, radio frequency, microwave, and laser radiation is highly specialized and expensive. Therefore, it should only be purchased when personnel capable of making the assessment are assigned.

9-9. Control of radiation sources

a. Control of both ionizing and nonionizing radiation hazards.

(1) Commanders of installations or activities responsible for the design or development of equipment capable of producing radiation or the incorporation of equipment or radioactive materials into Army systems will ensure that such equipment or devices have been evaluated for potential health hazards by USAEHA. This evaluation will take place during the research, development, test, and evaluation phase of the equipment and before acceptance or adoption (AR 70-1 and AR 385-10). A reevaluation of the equipment must be made if substantial modifications are made between the initial USAEHA evaluation and final acceptance or adoption.

(2) Commanders of installations or activities will ensure that—

(a) SOPs are published and enforced. They will specify the safety policies concerning operational limitations placed upon equipment, and the control of the movement of personnel to ensure that the exposure of personnel is minimized. Under no circumstances should exposure exceed established limits (AR 40-14/DLAR 1000.28, AR 40-46, and USAEHA TG No. 153). Copies of these SOPs will be forwarded to the RPO.

(b) All persons working in or frequenting any portion of a controlled area where radioactive materials are used or stored, or where equipment capable of producing radiation is energized, will be informed of the radiation hazard involved and instructed regarding the rules and procedures to be observed (AR 40-14/DLAR 1000.28, AR 40-46, and USAEHA TG No. 153). Instruction topics will include—

1. Safe working techniques and procedures.
2. Proper use of protective equipment and devices.
3. Procedures to be followed when an accident or incident occurs or in other emergency situations.
4. Daily preoperational, operational, and postoperational checks or surveys to ensure proper radiation safety.
5. Procedures for maintaining an operational log for each piece of equipment that will identify when interlocks and other control or warning devices are bypassed or overridden.

(c) Records of these instructions will be maintained by the RPO. They will include a brief outline of the instructions and a list of persons who received these instructions (AR 25-400-2).

(d) All controlled areas will be properly marked, have proper warning signs, and, where required, have proper warning signals and safety switches (AR 385-30, TB MED 521, and TB MED 525).

(e) Individuals are designated (in writing) to receive notice in the event of emergencies such as major spills or accidental release of radioactive material, bodily injury, fire, and major malfunction of

equipment that may produce or generate potentially hazardous radiation fields. A list of those persons and phone numbers will be posted in each controlled (restricted) area.

(f) A comprehensive inventory of radioactive material and equipment capable of producing radiation will be maintained (AR 40-46, AR 385-11, and TB MED 525). A copy of this inventory will be forwarded to the RPO.

b. Control of ionizing radiation hazards.

(1) Commanders of installations or activities will not possess, use, or transfer radioactive materials or use equipment capable of producing ionizing radiation in such a manner that could cause any person to receive a dose equivalent in excess of the radiation exposure standards specified in AR 40-14/DLAR 1000.28. Personnel responsible for the Radiation Protection Program will be continually vigilant concerning means to reduce exposure of personnel to ionizing radiation.

(2) The prevention of radioactive contamination is especially important for persons working with unsealed radioactive materials. Every user will maintain constant vigilance to minimize or prevent contamination and to contain its spread (AR 385-11 and TB MED 525).

(3) The RPO will perform surveys of all laboratories and work areas where radioactive materials are used or stored (AR 385-11, AR 700-64/DLAM 4145.8/NAVSUPINST 4440.34/MCO 10330.2/AFR 67-12, and TB MED 525). Radiation surveys should be performed routinely to indicate any changes in radiation levels in the work area. The surveys will evaluate the effectiveness of controls and procedures, ventilation, respiratory protective equipment, fixed and transferable surface contamination, airborne radioactive materials, and general exposure levels in the work area and environments. The frequency of any radiation survey will depend on such factors as the type of operation, the type and level of the radiation, the rate at which changes could unknowingly develop, the potential hazard, and the degree of personnel involvement. Since there may be possibilities of radiation or radioactive contamination occurring in generally unexpected locations, it is desirable to occasionally monitor so-called "clean/cold" or uncontrolled (unrestricted) areas.

(4) Smoking, eating, drinking, or applying cosmetics will not be permitted in work areas where unsealed radioactive materials are used or stored. Food or drink will not be stored in an area where radioactive materials are stored.

(5) To reduce the possibility of fire or other major disasters, buildings where radioactive materials are used and stored should be constructed of fire retardant materials. Fire prevention and military police personnel will be informed of any buildings or areas where potential radiation hazards may exist. Specified conditions under which it is safe to handle emergencies will be explained carefully to firefighters, security guards, and military police, and included in the appropriate SOP. These conditions will be respected unless they are modified by the responsible RPO or safety manager.

(6) All ionizing radiation accidents or incidents will be investigated and reported according to the requirements in AR 40-14/DLAR 1000.28 and AR 385-40.

(7) The planning, procurement, installation, calibration, preventive maintenance, evaluation, and use of diagnostic and therapeutic x-ray and gamma-beam equipment will be according to TB MED 521.

(8) Radiation therapy equipment used for human treatment will be calibrated by a qualified expert as required by TB MED 521. Evidence of calibration will be retained so it will be available to a surveyor or inspector (AR 25-400-2).

(9) As required by TB MED 521, a radiation protection survey by a qualified expert will be performed on all new or modified diagnostic or therapeutic facilities before clinical use.

(10) Industrial radiographic facilities will be classified and governed by procedures or conditions of the facility's Nuclear Regulatory Commission (NRC) license, DA radioactive material authorization or permit, or National Bureau of Standards Handbooks (NBSHs) 107, 111, or 114, as appropriate.

(11) A radiation protection survey by a qualified expert will be

performed on all new or modified industrial radiographic facilities before placing the equipment in routine operation.

(12) Radiation protection surveys will be performed periodically by the RPO to determine the exposure or exposure rate in the environment during operation of the equipment. These surveys will be conducted in areas as deemed necessary to evaluate and control the potential radiation hazard (AR 385-11 and USAEHA TG No. 153).

(13) All radioactive material, other than nuclear weapons, will be transported (shipped and received) according to the requirements of AR 385-11, Technical Manual (TM) 55-315, and TM 55-4470-400-12-1, as appropriate. The reporting of packaging and handling deficiencies will be under AR 700-68/DLAR 4145.25/NAVSUPINST 4000.34/AFR 67-8/MCO P4400.105, and discrepancies in shipment will be reported under AR 55-38/NAVSUPINST 4610.33/AFR 75-18/MCO 4610.19/DLAR 4500.15.

(14) The disposal of unwanted radioactive material will be per AR 385-11.

c. Control of nonionizing radiation hazards. Commanders of installations or activities responsible for the operation or testing of nonionizing generating equipment will take the necessary measures to ensure that—

(1) The potentially hazardous system has been evaluated by USAEHA before operation, and hazards criteria for the system are available and being observed.

(2) Personnel working in the vicinity of such equipment are informed of potential personal health hazards.

(3) SOPs are published and enforced to deal with operational limitations placed on the equipment and control of the radiation field to minimize personnel exposure.

(4) Periodic operational checks are conducted on all radiation safety devices such as alarms, lights, and interlocks installed on or near radiating sources. Such tests should be conducted prior to system operation. Defective devices should be repaired or replaced before continuing operation. A log should be maintained of all such cases.

(5) Safety procedures prescribed in TB MED 523 or TB MED 524, as applicable, are being complied with.

(6) When interlocks and other control or warning devices are bypassed or overridden, operational logs must indicate the purpose and duration.

(7) All nonionizing radiation areas are properly marked, have appropriate warning signs and, where required, have proper warning signals and safety switches.

(8) All alleged overexposures or accidents involving nonionizing radiation will be reported under the requirements in AR 40-400 and AR 385-40.

d. Monitoring personnel. Monitoring personnel will ensure that personnel potentially exposed in their occupations to ionizing radiation or radioactive materials are appropriately monitored. (See para 9-5.)

9-10. Licenses and authorizations

a. TB MED 525 gives policies and procedures for the control and use of radioactive materials for medical purposes. It also prescribes the requirements and procedures for obtaining an NRC license or DA radioactive material authorization for the possession and use of materials not under specific licensing control of the NRC, the materials being used for medical purposes.

b. AR 385-11 prescribes policies and procedures for the control and use of radioactive materials for nonmedical purposes. It also prescribes the requirements and procedures for obtaining an NRC license or DA radioactive material authorization or permit for the possession and use of materials not under specific licensing control of the NRC for nonmedical purposes.

c. AR 385-11, AR 700-64/DLAM 4145.8/NAVSUPINST 4000.34/AFR 67-8/MCO 4400.105, and TB MED 522 prescribe policies and procedures for the control of radioactive commodities within the DA supply system.

9-11. Radiologic facility shielding analysis

a. Design plans for the modification of existing medical radiographic facilities and design or construction specifications for new medical radiographic facilities must be reviewed by a qualified expert prior to modification or construction.

(1) The CONUS qualified expert review will be provided by either a MEDCEN having an assigned nuclear medical science officer or the USAEHA.

(2) The OCONUS qualified expert review will be provided by either the 7th Medical Command or the USAPACEHEA.

b. Plans and design specifications for industrial radiologic facilities will be reviewed and evaluated by a qualified expert before the modification or construction of a new industrial radiologic facility.

9-12. Laser and radiofrequency radiation exposure incidents: reporting procedures and registry maintenance

a. The radiological hygiene consultant to TSG will request that USAEHA conduct an on-site investigation when—

(1) An employee's lesion or ocular complaint may have resulted from exposure to nonionizing radiation.

(2) An exposure to radiofrequency radiation is five times or more the permissible exposure limit.

b. If an alleged laser or radiofrequency radiation exposure occurs, the affected installation—

(1) Calls USAEHA within 24 hours to forward incident information.

(a) During duty hours, contacts the Chief, Laser Microwave Division (AUTOVON 584-3932), or the Chief, Occupational and Environmental Medicine Division (AUTOVON 584-3534).

(b) During nonduty hours, contacts the duty officer, or noncommissioned officer-of-the-day (AUTOVON 584-4375).

(2) Ensures that the potentially exposed individual(s) receive(s) an appropriate medical evaluation within 24 hours of the exposure.

(3) Develops and transmits an—

(a) RCS MED-16 report per AR 40-400.

(b) RCS DD-R & E (AR) 1168 (Radiological Incident Report) per AR 385-40.

c. USAEHA will conduct investigations of alleged laser or radiofrequency radiation exposures and maintain the U.S. Army Laser and Radiofrequency Radiation Incident Registry.

Chapter 10 Pest and Disease Vector Prevention and Control

10-1. General

DA pest management, as a single comprehensive program, encompasses—

a. Personnel training.

b. Pest surveillance.

c. Recommendations for and implementation of IPM practices.

d. Assessment of environmental, safety, and health consequences of IPM practices.

e. Technical support.

10-2. Objectives

The comprehensive IPM program—

a. Provides prevention and control of pests that could cause major medical or economic harm.

b. Protects personnel and the environment from the toxic effects of pesticides.

c. Assures the preparedness of field units to prevent and control vector-borne disease in time of war, military conflict, or national disaster. (See chap 14.)

10-3. Functions

a. *Armed Forces Pest Management Board.* Under AR 10-64/OPNAVINST 6700.2/AFR 160-29/MCO 5420.18A, the board is a joint activity of DOD that—

Item 10.7

Joint Army Pamphlet 40-18

Personnel Dosimetry Guidance and Dose
Recording Procedures for Personnel Exposed to Ionizing Radiation

**Joint Army Pamphlet 40-18
DLAI 1000.30**

Medical Services

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

**Headquarters
Departments of the Army
Washington, DC
30 June 1995**

Unclassified

SUMMARY of CHANGE

DA PAM 40-18/DLAI 1000.30

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

This new pamphlet--

- o Establishes as low as reasonably achievable investigational program levels (para 2-1 and table 2-1).
- o Establishes the annual occupational dose limits and control measures necessary to meet the requirements of AR 40-14/DLAR 1000.28 (para 2-2 and fig 2-1).
- o Establishes emergency exposure limits (para 2-5).
- o Establishes dose limits for the public and occasionally exposed individuals (para 2-6).
- o Provides personnel dosimetry, bioassay, and medical surveillance guidance and procedures to meet the requirements of AR 40-14/DLAR 1000.28 (chap 3).
- o Outlines the requirements for reporting exposure from off-duty employment (moonlighting) (para 3-3g).
- o Provides decision trees for the radiation protection officer to use to determine which individuals will be provided dosimetry (figs 3-1 through 3-4).
- o Provides dose reporting and recording procedures necessary to meet the requirements of AR 40-14/DLAR 1000.28 (chap 4).
- o Establishes dosimeter results that require notification of the Office of the Surgeon General (para 4-10 and table 4-1).
- o Outlines the procedures for reporting overexposures (paras 4-10, 4-11, and 4-12).

Medical Services

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

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:



JOEL B. HUDSON
Acting Administrative Assistant to the
Secretary of the Army

By Order of the Director,
Defense Logistics Agency:

RAUL A. MARTINEZ
DASC Administrator

History. This printing publishes a new Department of the Army pamphlet.

Summary. This pamphlet provides personnel dosimetry guidance and dose recording procedures for personnel occupationally exposed to ionizing radiation. The medical policies and procedures regarding occupational ionizing radiation personnel dosimetry are prescribed in AR 40-14/DLAR 1000.28.

Applicability. This pamphlet applies to Department of the Army (DA) and Defense Logistics Agency (DLA) installations and activities. This includes the U.S. Army Reserve (USAR) and Army National Guard of the United States (ARNGUS), and civilians under contract to DA or DLA who perform tasks involving occupational exposure to DA and DLA controlled radioactive material or radiation-producing devices. This publication is not applicable during mobilization or anytime the U.S. Army adopts a state of readiness directly preparatory to actual or imminent armed conflict in a geographical zone where peacetime occupational radiation exposure conditions cannot reasonably be construed to prevail.

a. In particular, this pamphlet remains applicable to DA and DLA personnel deployed on either humanitarian or peacekeeping missions where the degree of readiness to

respond to hostile fire requires the availability of radioactive commodities, such as depleted uranium ammunition, as a contingency.

b. This pamphlet does NOT apply to the following:

(1) Personnel exposed to ionizing radiation and radioactive materials resulting from the use of ionizing radiation sources and devices in geographical areas or zones where—

(a) Hostile fire or combat already exists or is strongly anticipated to occur, or

(b) Department of Defense personnel expect to conduct a combat mission.

(2) Patients exposed to ionizing radiation in the course of medical and dental examination, diagnosis, or treatment. This exception does not apply to health care providers.

(3) Human research subjects exposed to ionizing radiation in the course of voluntary participation in medical research programs.

(4) Doses received from natural background radiation.

Proponent and exception authority. The proponent of this DA Pamphlet is the Surgeon General. The Surgeon General has the authority to approve exceptions to this pamphlet that are consistent with controlling law and regulation. Proponents may delegate this approval authority, in writing, to a division chief under their supervision within the

proponent agency who holds the grade of colonel or the civilian equivalent.

Interim changes. Interim changes to this pamphlet are not official unless they are authenticated by the Administrative Assistant to the Secretary of the Army. Users will destroy interim changes on their expiration dates unless sooner superseded or rescinded.

Suggested Improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Headquarters, Department of the Army (HQDA) (SGPS-PSP), 5109 Leesburg Pike, Falls Church, VA 22041-3258.

Distribution. Army:

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Chapter 1 Introduction

1-1. Purpose

This pamphlet provides specific guidance on—

a. Implementing the personnel dosimetry element of the occupational radiation protection program according to Department of Defense Instruction (DODI) 6055.8; Parts 19, 20, 34, 35, 39, and 40, Title 10, Code of Federal Regulations (10 CFR 19, 10 CFR 20, 10 CFR 34, 10 CFR 35, 10 CFR 39, and 10 CFR 40); 29 CFR 570; 29 CFR 1910; and volume 52, Federal Register, page 2822 (52 FR 2822).

b. Prescribing the ionizing radiation occupational dose limits (internal and external), personnel dosimetry, and bioassay requirements of AR 40-14/DLAR 1000.28.

1-2. References

Required and related publications and referenced forms are listed in appendix A.

1-3. Explanation of abbreviations and terms

Abbreviations and terms used in this pamphlet are explained in the glossary.

1-4. Waivers and exceptions

a. As a minimum, submit the following information to request a waiver or exception:

(1) Reference to the specific standard and to the specific paragraph under which the waiver or exception is being requested.

(2) Reasons why the standard cannot be met.

(3) Interim measure used that compensates for the inability to comply with the standard.

(4) Action being taken to meet the standard and the estimated date the action can be completed.

(5) Statement of the impact if the waiver or exception is not approved.

b. Forward the request for waiver, extension of waiver, or exception through command channels to Headquarters, Department of the Army (HQDA) (SGPS-PSP), 5109 Leesburg Pike, Falls Church, VA 22041-3258.

1-5. Procurement

The dosimetry requirements of this pamphlet must be incorporated into the procurement of contractor services initiated after the date of this publication. Preexisting contracts do not require modification.

Chapter 2 As Low As Reasonably Achievable Investigational Levels, Dose Limits, Emergency Exposure, and Control Measures

2-1. As low as reasonably achievable program investigational levels and actions

a. *Investigational levels.* For DA and DLA installations and activities, the investigational levels specified under any required as low as reasonably achievable (ALARA) program should be as shown in table 2-1. DA and DLA activities with a Nuclear Regulatory Commission (NRC) license may set their own investigational levels and these levels must be approved by the radiation protection officer (RPO) and the Radiation Control Committee (RCC).

Table 2-1
Investigational levels (mrem)(1,2)

	125	375
Whole body ³	375	1125
Lens of the eye	375	1125

Table 2-1
Investigational levels (mrem)(1,2)—Continued

Other ⁴	1250	3750

Notes:

¹ All values rounded to nearest 5 mrem.

² Action levels for some forms of uranium may be based upon their chemical toxicity rather than radiological properties (NRC Regulatory Guide 8.31). Facilities which produce radioactive effluents should also consider NRC Regulatory Guide 8.37.

³ TEDE.

⁴ Other includes: Shallow-dose equivalent (H(S)) to the skin or to any extremity, or the sum of the deep-dose equivalent (H(d)) and the committed dose equivalent (H(T)) to any individual organ or tissue other than the lens of the eyes.

b. *Total effective dose equivalent (TEDE).* When an installation or activity has individuals who are occupationally exposed to both external and internal radiation sources, the investigational levels specified under any required ALARA program will be specified in terms of the TEDE by taking into account the sum of the—

(1) Deep-dose equivalent (H(d)) from external sources, and

(2) Committed effective dose equivalent (CEDE) from internal radiation sources.

c. *Actions.* Local installations and activities may specify what actions are required of the RPO when an individual's quarterly dose exceeds either of the above investigational levels. At a minimum, such actions shall follow the guidance of NRC Regulatory Guide 10.8 and this pamphlet.

2-2. Occupational dose limits

a. *Dose limits for adults.*

(1) The annual, peacetime ionizing radiation dose received by adult occupationally exposed individuals, except for planned special exposure (PSE), must not exceed the following dose limits:

(a) The more limiting of—

1. The stochastic limit of a TEDE of 5 rems/year (yr) (50 millisieverts (mSv)/yr). The TEDE is the sum of the H(d) from external exposure and the CEDE(H(E,50)) from internal exposures.

2. The nonstochastic limit of the sum of the H(d) and the CEDE (H(E,50)) to any individual organ or tissue, other than the lens of the eye, for an adult occupationally exposed individual must not exceed 50 rems/yr (500 mSv/yr);

(b) An eye-lens dose equivalent of 15 rems (150 mSv); and

(c) An H(S) of 50 rems (500 mSv) to the skin or to any extremity.

(2) Figure 2-1 provides a bar chart depicting the annual dose limits specified above.

(3) The H(d) from external radiation exposure and the CEDE from internal radiation exposure must be added together only if both the external and internal dose are each likely to exceed 10 percent of the applicable dose limits specified in this paragraph. In most situations, occupationally exposed individuals sustain doses due almost exclusively to external exposure OR internal exposure, but not both. Thus, in most situations, only the H(d) or the CEDE must be measured; summation of external and internal doses will not normally be necessary.

(4) In cases of uniform whole-body irradiation, where the dose equivalent may be assumed to be the same for each organ, the TEDE is equal to the H(d) in the absence of any occupational internal exposure.

(5) DA and DLA installation and activity commanders must use the annual limits on intake (ALI) and derived air concentrations (DAC) published in 10 CFR 20 to limit radiation exposure from radionuclide intake or immersion. Alternative ALIs and DACs may be derived for different chemical or physical forms of radioactive material when such chemical or physical forms are known.

(6) To calculate the CEDE, the licensee may assume that the inhalation of one ALI or an exposure of 2000 DAC-hours results in a CEDE of 5 rems (50 mSv) for radionuclides that have their ALIs and DACs based on CEDE.

b. Dose limits for minors. The annual occupational dose limits for minors (less than 18 years of age) are 10 percent of the annual dose limits specified above for occupationally exposed adults.

c. Embryo or fetus dose limits.

(1) Commanders of installations and activities possessing ionizing radiation sources and devices must ensure that the dose to an embryo or fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv). In complying with this occupational dose limit for declared pregnant females, the commander should make efforts to maintain the monthly occupational radiation exposure rate ALARA and relatively uniform, that is, free of any substantial dose rate variation above the uniform monthly exposure rate.

(2) The dose to the embryo or fetus must be taken as the sum of the H(d) to the declared pregnant woman (external radiation sources) and the dose to the embryo or fetus from radionuclides in the embryo or fetus as well as radionuclides in the declared pregnant woman (internal radiation sources).

(3) Because they have a right to know, the RPO must inform females occupationally exposed to ionizing radiation of the different, lower permissible dose limits applicable to the embryo or fetus during pregnancy. A formal declaration of pregnancy, however, is the prerogative of each pregnant female. The RPO must not in any way intimidate or coerce a pregnant woman occupationally exposed to ionizing radiation to declare her pregnancy.

(4) A female occupationally exposed to ionizing radiation does NOT fall under the lower annual permissible dose equivalent for pregnant women until she formally declares her pregnancy, in writing, to the RPO. The RPO will then notify the applicable licensee.

(a) Such a written declaration shall be made on an SF 600 (Health Record—Chronological Record of Medical Care) and placed in the woman's health record.

(b) The woman shall complete, date, and sign the following SF 600 entry and provide a copy to the RPO.

I hereby make notification that I am occupationally exposed to radiation in the course of my normal job duties, and that I am now pregnant. My estimated date of conception is (date). I understand that by declaring my pregnancy, my occupational exposure to ionizing radiation will be controlled as prescribed in DA PAM 40-18/DLAI 1000.30.

(5) The RPO must provide instructions (and a copy of NRC Regulatory Guide 8.13) regarding the prenatal exposure risks and concerns to the developing embryo or fetus to females occupationally exposed to ionizing radiation (NRC Regulatory Guide 8.13 and National Council on Radiation Protection and Measures (NCRP) Report No. 53).

(6) If the dose to the embryo or fetus exceeds 0.5 rem (5 mSv), or is within 0.05 rem (0.5 mSv) of this dose by the time the woman declares the pregnancy to the RPO, the installation or activity must be deemed to be in compliance with (1) above, if the additional dose to the embryo or fetus does not exceed 0.05 rem (0.5 mSv) during the remainder of the pregnancy.

(7) Nursing mothers who are potentially exposed to intake of radionuclides require special consideration to limit the dose to their child. The child is considered a member of the general public.

d. Dose limit reduction. The installation or activity must reduce the dose that an occupationally exposed individual may be allowed to receive at the facility under the above dose limits during the remainder of any current year by the amount of any other occupational radiation dose known to have already been sustained elsewhere during the same current year.

e. Overseas standards. Whenever the occupational exposure dose limits specified in this pamphlet or the ALI and DAC values specified in 10 CFR 20 differ from those of the host country, the more restrictive of such limits or values must be used when required under the prevailing Status of Forces Agreement with the host country.

f. Less restrictive occupational dose limits. Occupational dose

limits less restrictive than those specified above cannot be applied to minors (under 18 years of age).

2-3. Determination of internal dose

a. When an occupationally exposed individual meets the criteria specified in paragraph 3-3b, the RPO must use the following suitable and timely measurements to assess the individual's internal radiation exposure:

- (1) Concentrations of radioactive materials in air in work areas;
- (2) Quantities of radionuclides in the body;
- (3) Quantities of radionuclides excreted from the body; or
- (4) Combinations of these measurements.

b. The RPO must determine the type and frequency of internal exposure assessments.

c. Bioassay assistance is available, upon request, from the U.S. Army Center for Health Promotion and Preventive Medicine (Provisional) (USACHPPM (Prov)) on a cost reimbursable basis.

2-4. Planned special exposures

Although defined in 10 CFR 20 and permitted under NRC licenses under very limited, highly controlled circumstances, DA or DLA NRC license holders will NOT perform PSEs without a waiver. (See chap 1, para 1-4.)

2-5. Emergency exposure dose limits

a. In an emergency, it may be necessary for individuals such as fire fighters or occupationally exposed individuals to exceed the limits stated in paragraph 2-2. In such a situation, the probable risk of high radiation exposure to the rescuer must be weighed against the expected benefits. Nothing in this chapter will be construed as limiting any immediate actions necessary to protect health and safety. When potentially high radiation exposure appears to be necessary to save a life, to the extent that the circumstances surrounding the emergency situation permit, installation and activity commanders will attempt to accomplish the following:

(1) Ensure the rescuer's dose equivalent does not exceed 100 rems (1000 mSv).

(2) Brief the rescuer on the potential acute and on the statistically inferred increased risk of cancer from doses that may be incurred during the rescue operation.

(3) Ensure that the rescuer is a volunteer and is fully informed of the risk if the expected rescue exposure is above 25 rem. See U.S. Environmental Protection Agency (EPA) Guide 400-R-92-001.

b. When required emergency actions do not involve lifesaving rescue, but may include protection of valuable equipment or property, ensure the individual's dose equivalent does not exceed 10 rems (100 mSv).

2-6. Dose limits for individual members of the public and occasionally exposed individuals

a. Members of the public.

(1) Commanders of installations or activities will conduct radioactive material and ionizing radiation-producing device use operations so that both—

(a) The TEDE to individual members of the public from radiation source operation under their control does not exceed 100 mrem/yr (1.0 mSv/yr) exclusive of—

1. The dose contribution from any authorized disposal of licensed radioactive material into the sanitary sewerage system.

2. Any dose received as a patient from medical or dental procedures.

(b) The dose in any unrestricted area from external ionizing radiation sources does not exceed 0.002 rem (0.02 mSv) in any 1 hour per 10 CFR 20.

(2) Authorization to exceed 100 mrem/yr (1.0 mSv/yr) (but not to exceed 500 mrem/yr) must be requested, through command channels, from OTSG and must be approved by OTSG prior to exceeding the 100 mrem limit. NRC licensees must request authorization from NRC per 10 CFR 20.

(3) Facilities or installations regulated by EPA's National Emissions Standards for Hazardous Air Pollutants will limit public exposure per 40 CFR 61.102.

(4) If members of the public are permitted to have access to radiation source use areas controlled by the commander of the installation or activity, the applicable dose limits which such members of the public can sustain must remain those specified in (1) above; the occupational dose limits of paragraph 2-2 will NOT apply.

b. Occasionally exposed individuals. Individuals who occasionally enter restricted areas must NOT receive a radiation exposure in excess of that permitted for any member of the public specified in *a* above. These individuals can include such people as messengers, delivery persons, scientists, engineers or managers who witness tests, inspectors visiting facilities, etc. These individuals *normally*—

(1) Do not work in a restricted area.

(2) Are not exposed to ionizing radiation as part of their duties.

c. Transient operations. Transient operations or practices may exist which require exposure of individuals, who are not normally occupationally exposed individuals, to levels in excess of the 0.1 rem (1.0 mSv) annual public limit. Submit a request for approval of these practices, in advance, to OTSG, HQDA(SGPS-PSP-E), 5109 Leesburg Pike, Falls Church, VA 22041-3258. In any case, the exposure of these individuals will not exceed 0.5 rem/yr (5.0 mSv/yr). The request shall include the following information:

(1) Demonstration of the need for and the expected duration of operations in excess of the limit in *a* above;

(2) Documentation of a program to assess and control dose within the 0.5 rem annual limit; and

(3) Procedures to be followed to maintain the dose ALARA.

2-7. Control measures

a. The installation or activity commander must design, select, use, and maintain radiation exposure control measures to ensure that

anticipated and actual occupational doses are maintained ALARA and do not exceed the limits specified above. The following guidance may be helpful in achieving this objective and may be developed for specific categories of workers or work situations:

(1) Development of a formal ALARA program with occupational personnel dose equivalent investigational levels as specified in table 2-1.

(2) Specification of radiation exposure rate or radioactive contamination trigger levels within ionizing radiation source use areas that signal the need for further investigation, recording, intervention, mitigation, and other measures.

b. Commanders of activities using ionizing radiation sources or devices shall ensure that occupationally exposed individuals who work in or frequent a restricted area will receive initial documented training on, but not limited to—

(1) Basic health risks due to radiation exposure at levels approximating those specified in paragraph 2-2.

(2) Somatic, in-utero, and genetic effects of exposure at levels approximating present occupational radiation dose levels.

(3) Basic radiation protection principles, including those specifically applicable to the workplace as discussed in pertinent NRC regulatory guides.

(4) Current Federal occupational dose limits (10 CFR 20).

c. Refresher training will be provided in each calendar year and documented. It must include reviews of pertinent items presented in initial training and updates on such things as—

(1) Changes in procedures and regulations.

(2) Review of accidents, spills, unintentional releases, misadministrations, unusual events, etc.

(3) Review of dosimetry results with emphasis on dose reduction and ALARA.

d. The extent of training must be commensurate with potential radiological health hazards created by the sources or devices in use.

ANNUAL DOSE LIMITS

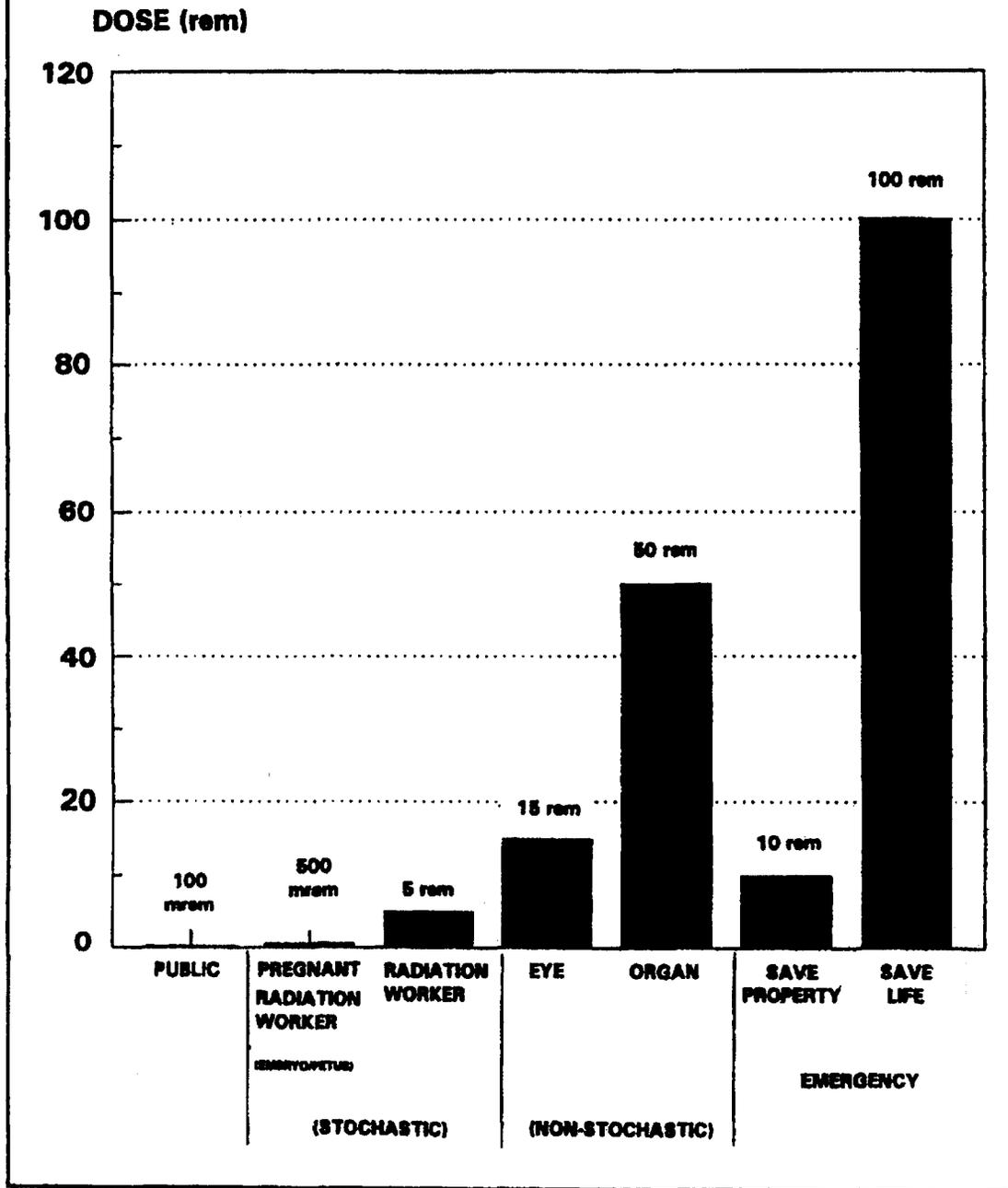


Figure 2-1. Annual Dose Limits

Chapter 3 Personnel Dosimetry Criteria, Guidance, Procedures, and Medical Surveillance

3-1. Conditions requiring individual dosimeters

a. Installations and activities possessing radioactive material and ionizing radiation-producing devices must monitor exposures to radiation and radioactive materials at levels sufficient to demonstrate compliance with the occupational dose limits in paragraph 2-2 and to effectively manage the ALARA program. As a minimum, the RPO will normally issue dosimeters to assess dose from ionizing radiation sources or devices *external to the body* to those individuals who meet the following criteria:

(1) Occupationally exposed to ionizing radiation in the course of normal job duties; and

(2) In the judgment of the RPO, have a reasonable probability of receiving the following doses in any 1 year:

(a) *Adult occupationally exposed individuals.* A dose in excess of 10 percent of the limits specified in paragraph 2-2a.

(b) *Adult occupationally exposed individuals.* Any dose associated with entering high or very high radiation areas.

(c) *All radiographers and radiographers' assistants, as defined in 10 CFR 34.* Any dose associated with the use of NRC- and nonNRC-licensed radioactive sources for radiographic purposes. Both a thermoluminescent dosimeter (TLD)-type dosimeter and a self-reading and alarming dosimeter will be issued and worn. The self-reading dosimeter must comply with 10 CFR 34.

(d) *Individuals who operate or use NRC-licensed well logging sources.* Any dose associated with the use of these devices. These individuals must be provided personnel dosimetry per 10 CFR 39. A TLD-type dosimeter must be issued and worn by all individuals working with such sources.

(e) *Minors and declared pregnant women.* A dose in excess of 10 percent of the limit specified in paragraphs 2-2b and 2-2c, respectively.

b. The RPO will institute monitoring of the occupational intake of radioactive material and assessment of the CEDE from radiation sources internal to the body only to those individuals who meet the following criteria:

(1) Occupationally exposed to ionizing radiation in the course of normal job duties.

(2) In the judgment of the RPO, have a reasonable probability of receiving the following dose in any 1 year:

(a) *Adult occupationally exposed individuals.* An intake of radioactive material in excess of 10 percent of the applicable ALIs specified in table 1, columns 1 and 2 of appendix B, 10 CFR 20.

(b) *Minors and declared pregnant women.* A CEDE in excess of 10 percent of the limit specified in paragraphs 2-2b and 2-2c, respectively, from radioactive sources internal to the body.

c. The RPO may institute monitoring on other individuals as required to provide dosimetry data needed for management of the ALARA program.

3-2. Guidance for issuing external radiation source dosimeters

a. For each type of external radiation source dosimeter under consideration (whole-body, collar, wrist, ring, etc.), the occupationally exposed individual should have a reasonable probability of exceeding 10 percent of the applicable occupational dose limits specified in paragraph 2-2 in order to be issued that particular type of dosimeter.

b. Some occupationally exposed individuals, such as fluoroscopic and cardiac catheterization personnel, are exposed to X rays scattered from the patient.

(1) Personnel, such as those working with medical fluoroscopic or cardiac catheterization X-ray equipment, exposed to X rays scattered from the patient, will wear both a collar dosimeter and a waist dosimeter. (The waist dosimeter is worn under the lead apron, between the waist and the shoulders; for pregnant personnel, over the

developing fetus.) Calculate the TEDE by multiplying the recorded collar dosimeter exposure (C) by 0.04, multiplying the recorded waist dosimeter exposure (W) by 1.5 and summing the two (TEDE = $0.04C + 1.5W$).

(2) In the practice of radiology involving fluoroscopy and cardiac catheterization, where the occupationally exposed individual is NOT behind any protective leaded control booth walls, lead aprons do indeed provide significant protection to the majority of the occupationally exposed individual's trunk (whole-body). Leaded aprons will, therefore, be worn and both a collar and a whole-body dosimeter will be issued to such individuals. The dose limit applicable to the collar badge which will trigger appropriate overexposure investigations will be based on the eye dose limit as specified in table 2-1. The dose limit applicable to the whole-body dosimeter that will trigger appropriate overexposure investigations will be based on the whole-body dose limit specified in table 2-1.

c. To determine if an occupationally exposed individual is likely to exceed 10 percent of occupational limits in paragraph 2-2, decision trees are provided in figures 3-1 through 3-4. All RPOs must follow these decision trees to determine which individuals will be provided dosimetry.

(1) Individuals excluded through the use of these decision trees will not be enrolled or be needlessly continued in the dosimetry program except on a case-by-case basis.

(2) For such case-by-case exceptions, the local RPO must compile a written justification that clearly sets forth the rationale for providing dosimetry to occupationally exposed personnel otherwise excluded by the decision trees. This documentation must be—

(a) Compiled for each case-by-case exception.

(b) Reviewed as an agenda item at the next RCC meeting.

(c) Included as an enclosure to the written RCC meeting minutes.

(d) Maintained with the individual's local dosimetry record file.

d. In research facilities a variety of isotopes may be used and the potential for exposure to over 10 percent of the allowable dose limits specified in paragraph 2-2 must be evaluated on a case-by-case basis. The RPO must determine the requirement for providing any dosimeters to exposed individuals working only with soft beta emitters, such as tritium, carbon-14, calcium-45, sulfur-35, and nickel-63, as well as alpha emitters.

(1) In general, working with such emitters does not require external dosimetry. If these isotopes are used in an unsealed fashion, bioassays to estimate internal dose may be necessary.

(2) The RPO must determine on a case-by-case basis the requirement for providing dosimetry to occupationally exposed individuals who work in a research environment using analytical chemistry laboratory equipment, such as X-ray diffraction, X-ray fluorescence, alloy analyzers, gas chromatographs, X-ray particle size analyzers, electron microscopes, and static eliminators.

e. Installation or activity commanders should not normally have to provide personnel dosimetry to the following individuals due to the very low probability of such individuals exceeding 10 percent of the occupational dose limits specified in paragraph 2-2. This includes individuals who—

(1) Operate, store, or handle explosive ordnance disposal X-ray systems.

(2) Work in the Directorate of Logistics' shipping, receiving, packaging, turn-in, and disposal operations.

(3) Use smoke detectors, chemical detectors, night vision devices, and flash X-ray systems.

(4) Work with or near depleted uranium munitions.

f. As soon as an occupationally exposed female declares her pregnancy in writing to the RPO, the installation or activity command, through the RPO, must provide *monthly* dosimetry throughout the duration of the pregnancy, to determine the extent of compliance with paragraph 2-2c. At the end of the pregnancy, the RPO will determine whether or not to continue dosimetry per this paragraph and paragraph 2-2.

3-3. Monitor dosimeters

a. In some areas where radioactive material or radiation-producing sources or devices are used, individuals may be occupationally exposed to ionizing radiation, but not meet the criteria of paragraph 3-1 and, consequently, not provided individual dosimetry. In such areas, the RPO may provide, for a limited period of time, temporary monitor dosimeters to a representative sample of such individuals in order to obtain confirmation that occupational doses of such individuals are less than 10 percent of the applicable limits.

b. The RPO must ensure that occupationally exposed individuals, who do not meet the criteria of paragraph 3-1, and who are provided temporary monitor dosimeters for dose confirmation purposes, will NOT—

- (1) Be issued such dosimeters for more than one quarter in any calendar year;
- (2) Wear such dosimeters for longer than one calendar quarter; or
- (3) Be issued and wear such dosimeters over two consecutive calendar quarters in two different calendar years.

3-4. Dosimeter wearing requirements and procedures

a. Conditions.

(1) To quantify an occupationally exposed individual's dose, the dosimeters issued must be worn during any such occupational radiation exposure. All occupationally exposed individuals who are provided dosimetry under this pamphlet must wear any and all dosimeters provided during their individual conditions of occupational exposure incident to employment with DA or DLA.

(2) All occupationally exposed individuals issued a dosimeter must ensure correct use and handling. Misleading dose reports and unnecessary investigations may result from improper use. Malicious exposure of a dosimeter is forbidden. Dosimeter abuse is a misuse of Government property. These acts may result in disciplinary action.

b. Proper dosimeter wearing procedure.

(1) Occupationally exposed individuals provided dosimetry service will wear the whole-body dosimeter—

- (a) Below the shoulders.
 - (b) Above the hips.
 - (c) Outside the clothing.
 - (d) On the portion or area of the body nearest the radiation source.
 - (e) With the dosimeter window facing out from the body.
- (2) Individuals who wear lead aprons while working with materials specifically licensed by the NRC will wear their whole body dosimeter outside of any shielding.
- (3) For individuals wearing lead aprons or similar protective garments while practicing medical radiology, the whole-body dosimeter will be worn outside the lead apron or on protective garment on the collar near the thyroid.
- (4) Do NOT use an individual's whole-body dosimeter to measure localized exposures.
- (5) Do NOT attach tape or other substances to the front of the dosimeter.
- (6) Do NOT exceed the normal dosimeter wearing period established by the U.S. Army Ionizing Radiation Dosimetry Center(AIRDC).

(7) Store dosimeters only in the RPO approved storage location at the end of an activity or work day.

c. Wearing additional dosimeters.

(1) The RPO may provide an occupationally exposed individual additional dosimeters (collar, wrist, ring, etc.) to assess localized occupational dose per paragraphs 2-1 and 3-2. The AIRDC will provide these dosimeters. NonAIRDC provided dosimeters may be additionally used, but will not be considered substitutes for official AIRDC dosimeters. Supplemental dosimeters may include—

- (a) Pocket ionization chambers.
 - (b) Self-reading pocket dosimeters with or without alarms.
 - (c) Other devices which provide localized exposure or exposure rate information.
- (2) When an occupationally exposed individual wears—

(a) Eye protection, if the eye protection provides at least 700 milligram (mg)/square centimeter(cm^2) thickness, the RPO will annotate on the dosimetry issue listing beside the individual's name "eye protection provided" so that the 1000 mg/ cm^2 depth dose will be computed by the AIRDC rather than the eye-lens dose at the standard depth of 300 mg/ cm^2 .

(b) A wrist or ring dosimeter, wear the dosimeter on the wrist or finger closest to the radiation source, oriented towards the radiation source, and under any protective gloves.

d. Identification.

(1) Dosimeters must display some readily identifiable, temporary individual identification (for example, an individual's name) to ensure that occupationally exposed individuals wear their own dosimeters.

(2) Individuals issued dosimetry will not permanently inscribe the dosimeter with a name, number, or other identifying symbol, and will not cover the dosimeter window.

(3) Immediate supervisors and the RPO must ensure that the dosimeter issued to one occupationally exposed individual is not issued to, or used by, another individual during the same wearing period.

(4) Government-owned, contractor-operated (GOCO)contractor personnel, other contract personnel working for the DA or DLA, as well as DA or DLA personnel who are occupationally exposed to ionizing radiation will not wear away from the Government job site or use Government issued dosimeters for nonDA or DLA work or other "moonlighting."

e. Storage. The RPO must approve all dosimeter storage locations. Each storage location must—

- (1) Be close to the area in which the occupationally exposed individual works, yet outside of the areas where the radiation sources or devices are actually used or located.
- (2) Be adequately shielded from ionizing radiation.
- (3) Contain a control dosimeter.

f. Dosimetry service.

(1) DA and DLA installations or activities will use the Army dosimetry service provided by the AIRDC.

(2) GOCO facilities (long-term contractors) will use the Army dosimetry service unless specifically exempted by contract.

(3) While the above DA and DLA requirements do not preclude the use of supplemental dosimeters, as discussed inc above, use of supplemental dosimeters does not obviate the need to use official AIRDC provided dosimeters. Contractors may provide their own dosimeters to their workers, however, AIRDC dosimeters will also be worn.

g. Personnel exposure from off-duty employment (moonlighting).

(1) Any military occupationally exposed individual who is performing off-duty employment that involves additional occupational exposure to ionizing radiation will provide copies of his or her occupational dose records to the RPO as a condition of his or her authorization to moonlight.

(2) Any civilian or nonmilitary individual, whose primary job duty involves occupational exposure to ionizing radiation, who also sustains additional occupational exposure while moonlighting must provide copies of his or her off-duty (moonlighting) dose records to the RPO.

(3) Individuals will provide these off-duty(moonlighting) dose records to the RPO—

- (a) No later than 2 months after such records are received by the moonlighting individual; or
- (b) Within 4 months following the termination of such moonlight employment, whichever is earlier.

(4) The RPO must forward the records of these doses to AIRDC for inclusion into the individual's lifetime dosimetry records.

h. Armed conflicts. Any time the U.S. Army adopts a state of readiness directly preparatory to actual or imminent armed conflict in a geographical zone where peacetime occupational radiation exposure conditions cannot reasonably be construed to prevail, the dosimetry requirements outlined within this pamphlet will NOT

apply. Use tactical dosimeters (that is, IM-9, IM-93, or DT-236) during these periods.

3-5. Processing dosimeters

Commanders will ensure that batches of dosimeters are returned to AIRDC in a timely fashion at the conclusion of the established wearing period.

a. Normally, timely means within 14 days after the end of the wearing period.

b. Batches of dosimeters not received by AIRDC within 30 days of the end of a wearing period will be considered delinquent.

c. AIRDC will notify commanders in writing when their dosimeter accounts become delinquent. AIRDC will furnish a copy of these notifications to the U.S. Army Materiel Command (AMC) Safety Office (AMCSG-R).

d. AMC Safety will notify appropriate licensees of delinquent dosimeter accounts that involve their NRC regulated commodities or materials.

e. AIRDC may require reimbursement for the cost of dosimeters delinquent by more than 60 days.

3-6. Bioassay requirements and procedures

a. Bioassay measurements are made when—

- (1) Required by 10 CFR 20.1502, or
- (2) Needed to confirm the adequacy of radiological controls (that is, engineering principles and calculations, respiratory protection, etc.), or
- (3) Needed to determine compliance with occupational dose limits, or
- (4) Useful for management of the ALARA program.

b. Bioassay services will be made available if the types and quantities of radioactive material licensed for use at the facility could, under normal operational occurrences, result in airborne levels in normally occupied areas exceeding DACs. Provisions must be made for collection of appropriate samples, analysis of bioassay samples, and evaluation of the results of these analyses to determine intakes (10 CFR 20; 10 CFR 35; and NRC Regulatory Guides 8.9, 8.11, 8.15, 8.20, 8.22, and 8.32).

c. Frequency of bioassay measurements is based upon the exposure potential and the physical and chemical characteristics of the radioactive material and the route of entry into the body.

d. Elements that will be considered in establishing a bioassay program include—

- (1) Potential exposure of the individual,
- (2) Retention and excretion characteristics of the radionuclide,
- (3) Sensitivity of the measurement technique, and
- (4) Acceptable uncertainty in the estimate of intake and H(T).

e. Bioassay measurements used for demonstrating compliance with occupational dose limits will be conducted often enough to identify and quantify potential exposures and resultant intakes, during any year, that are likely to collectively exceed 10 percent ALI.

f. Conversions between bioassay values and CEDE will be done with a dose analysis methodology approved by DA (OTSG).

g. The bioassay laboratory will forward bioassay reports to the RPO.

h. The RPO will ensure an individual qualified to use DA approved analysis methods will convert raw bioassay counting data generated locally over to a CEDE. A person who is qualified to use DA approved analysis methods is—

(1) A health physicist with specific training in the DA approved analysis methods program.

(2) One who has formal training and experience in internal dosimetry.

i. The RPO will review the results and ensure the results are converted to dose when necessary. The RPO will then—

(1) Forward these results quarterly to the dose record custodian for inclusion in the occupationally exposed individual's dosimetry record.

(2) Send a copy of the results for inclusion in the individual's lifetime dose history maintained by the AIRDC.

j. The bioassay results forwarded to the AIRDC will include the following information:

- (1) CEDE as determined by DA approved dose analysis methods.
- (2) Lower limit of detection for the counting system.
- (3) Isotope detected.
- (4) Individual's name.
- (5) Social security number of exposed individual.
- (6) Occupational specialty code of exposed individual.
- (7) Assigned work location of exposed individual.
- (8) Dates or duration of the suspected or possible internal exposure.
- (9) Whether the exposure was chronic or acute.

k. USACHPPM (Prov) will provide bioassay counting service to DA and DLA installations and activities on a reimbursable cost basis. Whenever a DA or DLA installation or activity elects to contract for bioassay service from a non DA or DLA activity, the contract will stipulate that the entity providing such service must meet the radiobioassay criteria established by the American National Standard Institute (ANSI) Guide N13.30. Contact Commander, USACHPPM (Prov), ATTN: MCHB-DL-LOQ/Laboratory Samples, Aberdeen Proving Ground, MD 21010-5422; DSN 584-3983 or Commercial (410)671-3983 for information regarding bioassay sampling materials, collection procedures, and sample shipping requirements.

3-7. Medical surveillance

Refer to AR 40-14/DLAR 1000.28, paragraph 4-4, for medical surveillance requirements.

GENERAL

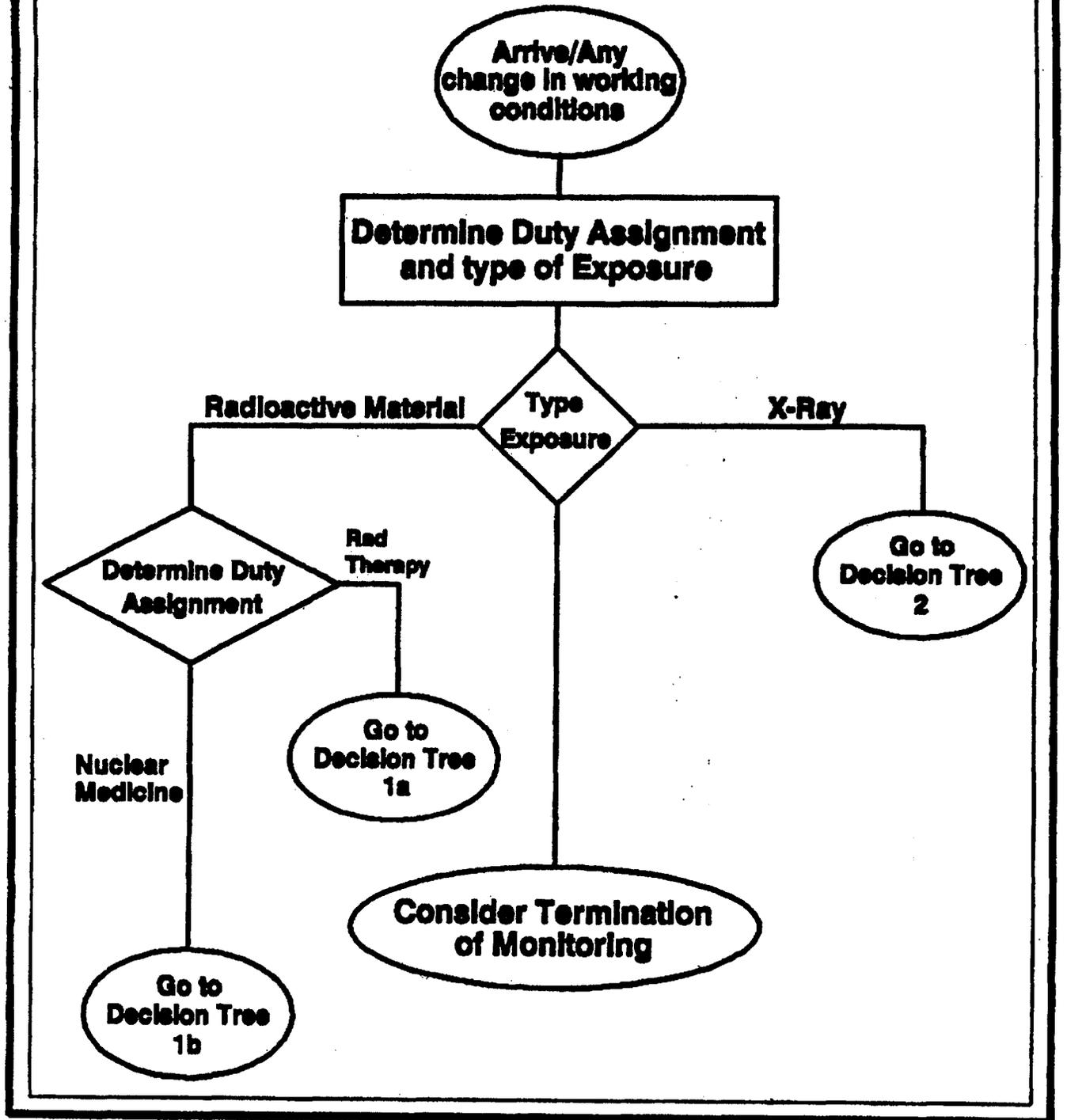
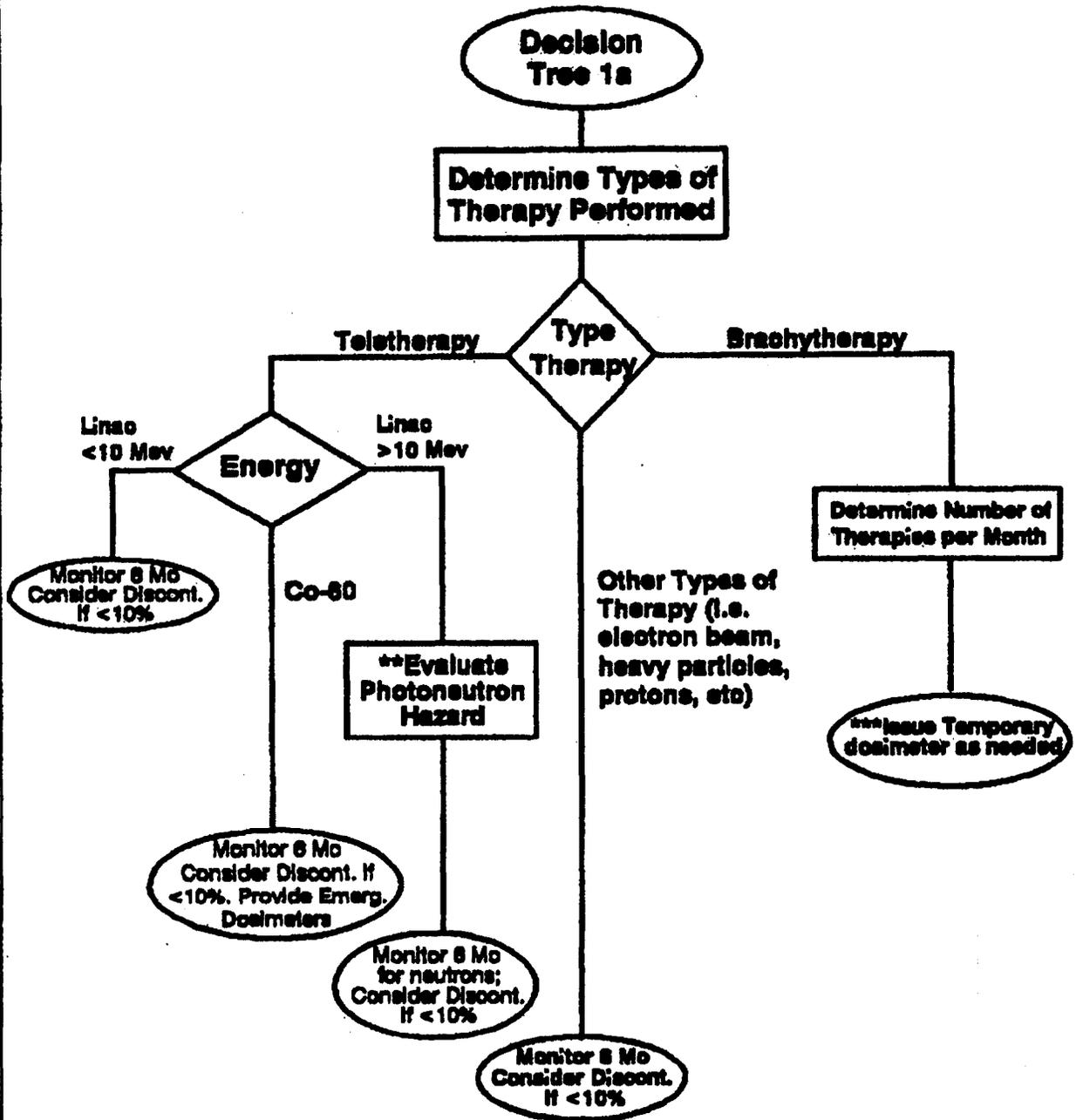


Figure 3-1. Decision Tree—General

OCCUPATIONAL EXPOSURE IN RADIATION THERAPY



**If no record of a neutron survey is on file, request a survey by USAEHA through command channels.
 ***Issue temporary dosimeters on an as needed basis each time sealed source brachytherapies are performed.

Figure 3-2. Decision Tree—Radiation Therapy

OCCUPATIONAL EXPOSURE IN NUCLEAR MEDICINE

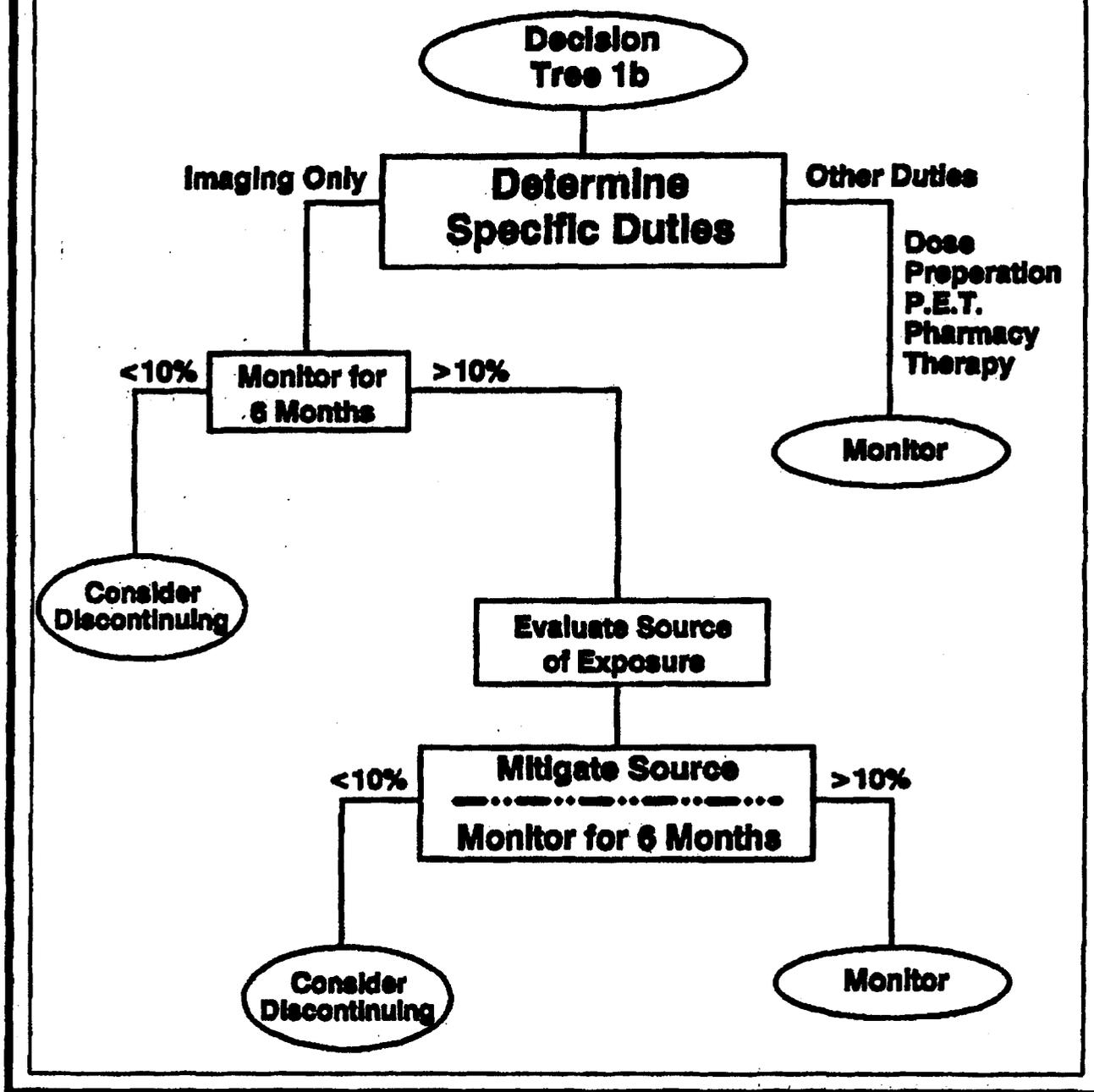


Figure 3-3. Decision Tree—Nuclear Medicine

OCCUPATIONAL EXPOSURE TO X-RAYS

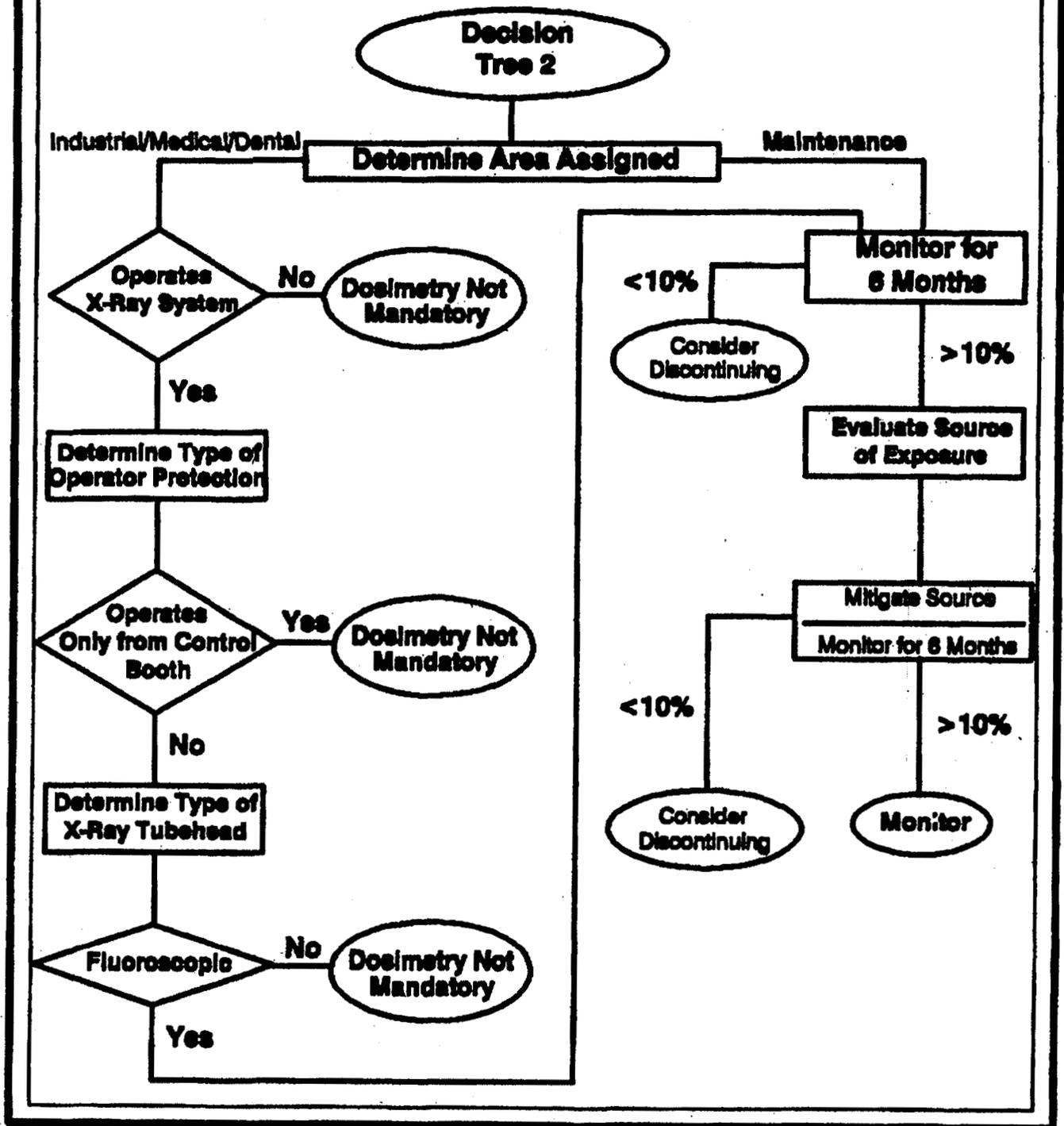


Figure 3-4. Decision Tree—X-ray Exposure

Chapter 4 Dose Reporting and Recording Procedures

4-1. Dose record custodian

The installation or activity commander may designate in writing one of the following individuals to serve as a dose record custodian responsible for preparing and maintaining the records of occupational exposure to ionizing radiation (dose records):

- a. Custodian of health records.
- b. Custodian of the civilian worker medical files.
- c. The individual who prepares the dosimetry report and controls dosimeter issuance and recovery.
- d. The RPO. Records of exposure are normally prepared by the AIRDC and maintained by the installation or activity.

4-2. DD Form 1952

a. *Purpose.* The DD Form 1952 (Dosimeter Application and Record of Occupational Radiation Exposure) documents—

- (1) Previous occupational ionizing radiation history, analogous to NRC Form 4 (Cumulative Occupational Exposure History).
- (2) Required training or instruction provided to all personnel in restricted areas.
- (3) The type of dosimetry provided to the occupationally exposed individual.

b. *Completion procedures.* See AR 40-14/DLAR 1000.28, appendix B, for completion instructions and an example of a filled-in DD Form 1952.

4-3. Automated dosimetry record

- a. The AIRDC—
 - (1) Provides a complete occupational dose history as reflected by current repository file information for each occupationally exposed individual upon written request from the RPO.
 - (2) Provides calendar-year-to-date updates on a quarterly basis.
 - (3) Maintains dose records of—
 - (a) Whole-body and skin of the whole-body.
 - (b) Head and neck.
 - (c) Hands and forearms.
 - (d) Feet and ankles.
 - (e) Lens of the eye.
- b. The RPO—
 - (1) Verifies that all automated dosimetry record (ADR) related information is contained in the ADR. The RPO and AIRDC must correct any errors by written correspondence.
 - (2) Signs and dates the ADR to certify the information as the occupationally exposed individual's official dose record.
 - (3) Reviews and certifies each of the AIRDC updates and adds them to each occupationally exposed individuals' record. The RPO need not retain the previous updates for calendar quarters 1, 2, and 3 once replaced by the succeeding update. The 4th quarter report includes all dose data for the entire year and should be retained permanently by the RPO.

4-4. Record retention

Refer to AR 40-14/DLAR 1000.28, paragraph 6-4, for record retention requirements.

4-5. Record disposition

Refer to AR 40-14/DLAR 1000.28, paragraph 6-5, for record disposition requirements.

4-6. Employment termination dose reports

- a. For NRC regulated occupationally exposed individuals terminating employment, the RPO must—
 - (1) Provide a written dose report when requested to such individuals within 30 days after the request or within 30 days of when the dose for the final dosimeter wearing period is determined (whichever is later). Provide this report to either the previously occupationally exposed individual or to the individual's designee.
 - (2) Ensure that the occupationally exposed individual's request

includes appropriate identifying data, such as a social security number and dates and location of employment.

- (3) Ensure that the report contains—
 - (a) Results of any calculations and analyses of any radioactive material deposited in the body.
 - (b) The name of the installation or activity at which the individual was provided personnel dosimetry.
 - (c) The individual's name and social security number.
 - (d) The individual's exposure information.
 - (e) The following statement:

This report is furnished to you under the provisions of the Nuclear Regulatory Commission regulation (10 CFR 19) or Department of Labor regulation (29 CFR 1910). You should preserve this report for further reference.

b. In addition to providing the dose report to the occupationally exposed individual terminating employment, installations or activities that possess NRC licenses must submit copies of this report, for occupationally exposed individuals whose dose was regulated under the licenses, through major Army command channels to the Director of Management and Program Analysis, Nuclear Regulatory Commission, Washington, DC 20555 per 10 CFR 20.2206.

c. When an occupationally exposed individual, who is not under NRC control, terminates employment and requests it, the RPO should give the individual a copy of the final dosimeter results in a timely fashion. Normally this will occur within 30 days after receipt of dosimetry results from routine processing of the terminating employee's dosimeter.

4-7. Disclosing information on records

Refer to AR 40-14/DLAR 1000.28, paragraph 6-6, for requirements on disclosing record information.

4-8. Record transfer

Refer to AR 40-14/DLAR 1000.28, paragraph 6-7, for record transfer requirements.

4-9. Record inspection

Refer to AR 40-14/DLAR 1000.28, paragraph 6-8, for record inspection requirements.

4-10. External potential overexposure criteria and investigations

- a. The RPO must return dosimeters to AIRDC for processing—
 - (1) At the end of the established wearing period, or
 - (2) When a potential overexposure is suspected per SB 11-206.
- b. The AIRDC must report to the RPO a personnel dosimeter result that exceeds the applicable ALARA Investigational Level II found in table 2-1. These dosimeters will be declared to be potentially overexposed.
- c. The RPO must identify, in writing, dosimeters known to have been used under nonoccupational, emergency conditions or those suspected of having sustained a potential overexposure, when sending such dosimeters to the AIRDC for processing.
- d. The AIRDC must report to the OTSG any personnel dosimeter result that exceeds the applicable dose levels found in table 4-1. These dosimeters may indicate exposure conditions that could result in annual doses that exceed NRC limits. The AIRDC must also report such potential overexposures directly to the RPO of the exposed individual's unit or activity and provide a copy to the AMC Safety Office.

Table 4-1
Dosimeter results that require notification of OTSG (mrem)(1)

Body parts	Quarterly monitoring	Monthly monitoring
Whole body ²	1250	400
Lens of the eye	3750	1250

Table 4-1
Dosimeter results that require notification of OTSG
(mrem)(1)—Continued

Body parts	Quarterly monitoring	Monthly monitoring
Other ³	12500	4150

Notes:

- ¹ 1. All values rounded to nearest 50 mrem.
2. TEDE.
3. Other includes: The H(S) to the skin or to any extremity, or the sum of the H(d) and the H(T) to any individual organ or tissue other than the lens of the eyes.

e. The OTSG must in turn forward the results through command channels to the potentially overexposed individual's location per SB 11-206.

f. For dosimeters potentially overexposed at a rate in excess of the quarterly or monthly values specified in table 4-1, the RPO must—

(1) Recommend immediate removal from duties involving further exposure to ionizing radiation, pending the results of a full investigation, if the reported dose added to the individual's accumulated dose for the year exceeds the annual dose limit.

(2) Conduct an investigation.

(3) Determine the cause, timeframe, and circumstances surrounding the apparent potential overexposure.

(4) Correct or recommend to the commander corrective actions to prevent recurrence of the situation.

(5) Determine whether or not the dosimeter was actually worn by the occupationally exposed individual during the dosimeter wear period.

(6) Immediately notify the licensee if NRC licensed materials were involved in the overexposure and it was determined the badge was actually worn.

(7) Fully document the investigation. The written investigation report shall contain—

(a) A copy of the affected occupationally exposed individual's ADR covering the previous 12 months of exposure, if available.

(b) Results of any bioassays and medical examinations.

(c) Statements from supervisors or other knowledgeable personnel.

(d) A statement from the affected occupationally exposed individual stating:

To the best of my knowledge and belief I (did) (did not) receive this dose because (state reason).

(e) Procedures describing corrective actions.

(8) Review the ALARA program to reduce the likelihood of recurrence and minimize future doses from the wearer's duties, if the indicated overexposure was actually received by the wearer of the dosimeter.

g. When the result of an investigation conclusively reveals an exposure in excess of those in table 4-1, the RPO must—

(1) Notify the immediate supervisor if the exposure exceeds the monthly limit but the total calendar quarter and calendar year limits are not exceeded.

(2) Notify the immediate supervisor if the total calendar quarter limit is exceeded but the total calendar year limit is not exceeded. Recommend that the person be allowed to return to duty involving potential exposure to ionizing radiation only under conditions which preclude exceeding the calendar year limit.

(3) Notify the immediate supervisor if the exposure exceeds the annual limit, and

(a) Recommend prompt removal of the individual from duties involving potential exposure to ionizing radiation.

(b) Recommend the individual return to duty involving potential exposure to ionizing radiation only upon consultation with the U.S.

Army Medical Command (MCHO-CL-W) and no sooner than the end of the calendar year.

(c) Follow 10 CFR Parts 20, 34, 35, 39, and 40 as applicable, appropriate NRC regulatory guides, and this pamphlet as applicable regarding reporting of any overdoses for occupationally exposed individuals regulated under an NRC license to the NRC.

h. Upon investigation, the RPO will refer any occupationally-exposed individual who sustains an actual overexposure to the supporting occupational health physician. The occupational health physician in consultation with the RPO or designated representative will evaluate the worker's dose background and take into appropriate consideration the—

(1) Total reported dose and effective dose equivalent(H(E)).

(2) Type and energy of the ionizing radiation.

(3) Exposed body part or organ that sustained the reported overdose.

(4) Dosimeter wearing period.

(5) Time elapsed between overdose and notification.

(6) Other factors including previous occupational dose history.

i. The supporting occupational health physician and local RPO will—

(1) Determine the appropriate (if any) medical examination and medical or laboratory tests, including any bioassay procedures, necessary to document any potential short- or long-term health hazard or injury.

(2) Plan appropriate medical care (AR 40-501 or DLA Manual (DLAM) 6055.1).

j. The RPO will—

(1) Forward the investigation report as follows:

(a) Where an NRC license is *not involved*, forward through command channels to OTSG, HQDA(SGPS-PSP-E), 5109 Leesburg Pike, Falls Church, VA 22041-3258 or Director DLA (CAAE), Alexandria, VA 22304-6100, as applicable.

(b) Where an NRC license is *involved*, forward through command channels to the license manager for concurrence and transmittal to OTSG or DLA, as applicable.

(2) Maintain the investigation records as a permanent file per AR 25-400-2, and

(3) Provide to the individual concerned, and the individual's medical record custodian, a copy of the final investigation report including any revisions made to the individual's reported dose.

k. The OTSG or DLA director will provide AIRDC and NRC license managers (if applicable) the approved dose to be officially posted to the affected occupationally exposed individual's dosimetry record.

l. The medical records custodian will include a copy of the final investigation report, including any revised dose, in the individual's health or medical records.

4-11. Internal potential overexposure criteria and investigations

a. When internal exposure indicators(for example, bioassays, air samples, and similar tests) suggest an individual has been exposed in excess of investigational level II (see table 2-1), the event must be declared a potential overexposure.

b. When soluble uranium intake exceeds 10 mg per 50-hour work week, the event will be declared a potential overexposure.

c. Potential overexposures to internal radionuclides will be handled per applicable procedures in paragraph 4-10 above.

d. The RPO will ensure that appropriate bioassay samples are collected and analyzed as needed to establish retention and excretion curves for the individual.

4-12. Combined external and internal potential overexposure criteria and investigations

a. The AIRDC dosimetry service gives local RPOs a means of assessing the *external* doses sustained by occupationally-exposed individuals. Most occupationally-exposed individuals are exposed to either external or internal radiation, but generally not both at the same time. For those few individuals occupationally exposed to *both* external and internal radiation, the local RPO—

(1) Must ensure that appropriate bioassays are provided to such individuals. The local RPO or another individual qualified to use DA approved analysis methods can then determine the individual's CEDEs.

(2) Will investigate TEDEs and CEDEs that—

(a) Exceed an investigational level II found in table 2-1, or

(b) Exceed a notification level found in table 4-1.

b. When investigating TEDEs and CEDEs in the dose ranges specified in table 4-1, remove the occupationally exposed individual from duties which could lead to reportable overexposures until the overdose investigation is completed.

c. The investigation report must address the appropriate items specified in paragraphs 4-10 through j, above.

d. The RPO will—

(1) Conduct an investigation.

(2) Determine whether or not any external radiation dosimeters were actually worn by the occupationally exposed individual during the apparent excessive exposure.

(3) Correct the circumstances that caused the excess dose.

(4) Document the investigation.

(5) Review the effectiveness of the ALARA program.

e. NRC licensees will follow 10 CFR Parts 20,34, 35, 39, and 40, as applicable, and appropriate NRC regulatory guides.

4-13. Administrative dose assessment

a. If a dosimeter is lost or damaged or the occupationally exposed individual's TEDE or CEDE cannot otherwise be determined, the RPO must use one or any combination of the following methods to estimate a realistic administrative dose:

(1) Calculate the affected occupationally exposed individual's dose based on occupancy or workload information and radiation exposure levels at the radiation source operator location.

(2) Estimate the dose measured by a supplemental dosimeter if a primary dosimeter or official AIRDC provided dosimeter is unavailable.

(3) Average the affected occupationally exposed individual's previous occupational dose for the preceding 6 to 12 months.

Note. Use this method only if the exposure conditions for the period for which the dose is being estimated do not differ significantly from the conditions under which the previous, known doses were sustained.

(4) Estimate doses accrued by coworkers performing similar duties and having similar exposure opportunities.

b. If an administrative dose is assigned, the RPO will—

(1) Annotate on the local ADR that an administrative dose has been assigned.

(2) Indicate the administrative dose determination method(s) used on the ADR from a above.

(3) Forward a report to the Chief, USAIRDC, ATTN:AMXTM-SR-D, Lexington, KY 40511-5102, which contains the—

(a) Occupationally exposed individual's full name and social security number.

(b) Occupational specialty code (that is, military occupational specialty, specialty skill identifier, or DA civilian specialty code).

(c) Location where the individual is presently working to include AIRDC dosimetry account code.

(d) Administrative dose assessed.

(e) The type of administrative dose assessed (that is, H(d), H(S), eye-dose equivalent), as applicable.

(f) Method of determining the administrative dose to include type of dosimetric dose (that is, whole-body, collar, wrist, ring TLD, etc.).

(g) Period of time covered by the administrative dose >

(h) Authenticating signature of the RPO.

(4) Maintain a copy of this administrative dose correspondence sent to the AIRDC in each occupationally exposed individual's local dosimetry record file until this administrative dose appears on the individual's lifetime dose history.

Appendix A References

Section I Required Publications

AR 25-400-2
The Modern Army Recordkeeping System (MARKS). (Cited in para 4-10j(2).)

AR 40-14/DLAR 1000.28
Occupational Ionizing Radiation Personnel Dosimetry. (Cited in paras 1-1b, 3-7, 4-4, 4-5, 4-7, 4-8, and 4-9.)

EPA 400-R-92-001
Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, Revised 1991. (Cited in para 2-5a(3).) (This publication may be obtained from the National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161.)

NRC Regulatory Guide 10.8
Guide for the Preparation of Applications for Medical Use Programs. (Cited in para 2-1c.) (This publication may be obtained from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

Supply Bulletin (SB) 11-206
Personnel Dosimetry Supply and Service for Technical Radiation Exposure Control. (Cited in paras 4-10a(2) and e.)

Section II Related Publications

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

ANSI N13.30
Performance Criteria for Radiobioassay

AR 25-1
The Army Information Resources Management Program

AR 40-3
Medical, Dental, and Veterinary Care

AR 40-5
Preventive Medicine

AR 40-66
Medical Record Administration

AR 40-501
Standards of Medical Fitness

AR 310-25
Dictionary of U.S. Army Terms

AR 385-11
Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety)

AR 385-40
Accident Reporting and Records

AR 385-80
Nuclear Reactor Health and Safety Programs

DLAM 6055.1
DLA Safety and Health Manual

DODI 6055.8
Occupational Radiation Protection Program. (This publication may be obtained from the Commanding Officer, ATTN: Code 301, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

ICRP Publication 12
General Principles of Monitoring for Radiation Protection of Workers

ICRP Publication 23
Report of the Task Group on Reference Man

ICRP Publication 26
Recommendations of the International Commission on Radiological Protection

ICRP Publication 30
Limits for Intakes of Radionuclides by Workers

ICRP Publication 48
The Metabolism of Plutonium and Related Elements

ICRP Publication 51
Data for Use in Protection Against External Radiation

ICRP Publication 60
1990 Recommendations of the International Commission on Radiation Protection

National Bureau of Standards Handbook 114
General Safety Standards for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV

NCRP Report No. 38
Protection Against Neutron Radiation

NCRP Report No. 39
Basic Radiation Protection Criteria

NCRP Report No. 53
Review of NCRP Radiation Dose Limits for Embryo and Fetus in Occupationally Exposed Women

NCRP Report No. 57
Instrumentation and Monitoring Methods for Radiation Protection

NCRP Report No. 58
A Handbook of Radioactivity Measurements Procedures

NCRP Report No. 96
Comparative Carcinogenicity of Ionizing Radiation and Chemicals

NCRP Report No. 106
Limit for Exposure to

NCRP Report No. 114
Maintaining Radiation Protection Records

NCRP Report No. 116
Limitation of Exposure to Ionizing Radiation

NRC Regulatory Guide 8.7, Revision 1
Instructions for Recording and Reporting Occupational Radiation Exposure Data

NRC Regulatory Guide 8.9, Revision 1
Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program

- NRC Regulatory Guide 8.10, Revision 1-R**
Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable
- NRC Regulatory Guide 8.11**
Applications of Bioassay for Uranium
- NRC Regulatory Guide 8.13, Revision 2**
Instruction Concerning Prenatal Radiation Exposure
- NRC Regulatory Guide 8.15**
Acceptable Programs for Respiratory Protection
- NRC Regulatory Guide 8.18, Revision 1**
Information Relevant to Ensuring that Occupational Radiation Exposures at Medical Institutions Will Be As Low As Reasonably Achievable.
- NRC Regulatory Guide 8.20, Revision 1**
Applications of Bioassay for I-125 and I-131
- NRC Regulatory Guide 8.22, Revision 1**
Bioassay at Uranium Mills
- NRC Regulatory Guide 8.25, Revision 1**
Air Sampling in the Workplace
- NRC Regulatory Guide 8.31**
Information Relevant to Ensuring that Occupation Radiation Exposures at Uranium Mills Will Be As Low As Is Reasonably Achievable
- NRC Regulatory Guide 8.32**
Criteria for Establishing a Tritium Bioassay Program
- NRC Regulatory Guide 8.34**
Monitoring Criteria and Methods to Calculate Occupational Radiation Doses
- NRC Regulatory Guide 8.35**
Planned Special Exposures
- NRC Regulatory Guide 8.36**
Radiation Dose to the Embryo/Fetus
- NRC Regulatory Guide 8.37**
ALARA Levels for Effluents from Materials Facilities
- TB MED 525**
Control of Hazards to Health from Ionizing Radiation Used by the Army Medical Department
- 10 CFR 19**
Notices, Instructions, and Reports to Workers; Inspections
- 10 CFR 20**
Standards of Protection Against Radiation
- 10 CFR 30**
Rules of General Applicability to Domestic Licensing of Byproduct Material
- 10 CFR 31**
General Domestic Licenses for Byproduct Material
- 10 CFR 32**
Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material
- 10 CFR 33**
Specific Domestic Licenses of Broad Scope for Byproduct Material
- 10 CFR 34**
Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations
- 10 CFR 35**
Medical Use of Byproduct Material
- 10 CFR 39**
Licenses and Radiation Safety Requirements for Well Logging
- 10 CFR 40**
Domestic Licensing of Source Material
- 29 CFR 570**
Child Labor Regulations, Orders, and Statements of Interpretation
- 29 CFR 1910**
Occupational Safety and Health Standards
- 40 CFR 61**
National Emission Standards for Hazardous Air Pollutants
- 52 FR 2822**
Radiation Protection Guidance to Federal Agency for Occupational Exposure
- Unnumbered publication**
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- Unnumbered publication**
Radiation Protection Guidance for Federal Agencies, Federal Radiation Council
- Unnumbered publication**
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- Unnumbered publication**
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- Section III**
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Dosimeter Application and Record of Occupational Radiation Exposure
- NRC Form 4**
Cumulative Occupational Exposure History

SF 600
Health Record—Chronological Record of Medical Care

Glossary

Section I Abbreviations

ADR
Automated Dosimetry Record

AIRDC
U.S. Army Ionizing Radiation Dosimetry Center

ALARA
as low as reasonably achievable

ALI
annual limits on intake

AMC
U.S. Army Materiel Command

ANSI
American National Standards Institute

AR
Army Regulation

ARNGUS
Army National Guard of the United States

Bq
becquerel

CEDE
committed effective dose equivalent

CFR
Code of Federal Regulations

Ci
curie

cm
centimeter (length)

cm(2)
square centimeter (area)

DA
Department of the Army

DAC
derived air concentration

DA Pam
Department of the Army Pamphlet

DLA
Defense Logistics Agency

DLAM
Defense Logistics Agency Manual

DODI
Department of Defense Instruction

EPA
U.S. Environmental Protection Agency

FR
Federal Register

G(y)
gray

GOCO
Government owned, contractor operated

H(d)
deep-dose equivalent

H(E)
effective dose equivalent

H(S)
shallow-dose equivalent

H(T)
committed dose equivalent

HQDA
Headquarters, Department of the Army

ICRP
International Commission of Radiological Protection

MeV
million electron volts

mg
milligram

mrem
one thousandth of one rem

mSv
millisievert

NCRP
National Council on Radiation Protection and Measurements

NRC
Nuclear Regulatory Commission

OTSG
Office of the Surgeon General

PSE
planned special exposure

Q
quality factor

rad
radiation absorbed dose

RCC
Radiation Control Committee

rem
unit of dose equivalent

RPO
radiation protection officer

SB
Supply Bulletin

SF
Standard Form

Sv
sievert

TEDE
total effective dose equivalent

TLD
thermoluminescent dosimeter

USACHPPM (Prov)
U.S. Army Center for Health Promotion and Preventive Medicine(Provisional)

USAR
U.S. Army Reserve

W(T)
Tissue Weighting Factor

yr
year

Section II Terms

Absorbed dose (D)
The mean energy imparted by ionizing radiation per unit mass of a specified irradiated material at the place of interest in the material. The units of absorbed dose are the rad and the gray(Gy). One rad is equal to an absorbed dose of 100 ergs/gram or 0.01 joule/kilogram. One Gy is equal to an absorbed dose of 1 joule/kilogram which is also equivalent to 100 rads. For purposes of radiation protection, 1 rad is considered to be the dose delivered by one roentgen of X-ray or gamma radiation.

Activity
The rate of disintegration (transformation) or decay of radioactive material. The units of activity are curie (Ci) and the becquerel(Bq). 1 Ci = 3.7×10^{10} disintegrations/second; Bq = 1 disintegration/second, 1 Ci = 3.7×10^{10} Bq. One microcurie = 2.22×10^6 disintegrations/minute.

Adult
An individual 18 years of age or older.

Airborne radioactive material
Radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases.

Airborne radioactivity area
A room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of NRC regulated radioactive material, exist in concentrations either:

- a. In excess of the DAC specified in appendix B, 10 CFR 20 or,
- b. To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the ALI or 12 DAC-hours.

Annual limit on intake (ALI)

The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year (40 hours per week for 50 weeks). ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a CEDE of 5 rems (0.05 Sv) or an H(T) of 50 rems (0.5 Sv) to any individual organ or tissue. The ALI values are based on the intake rate and standards for "reference man" as defined in ICRP Publication 23.

As low as reasonably achievable (ALARA)

a. 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—

- (1) State of technology.
- (2) Economics of improvements in relation to the state of technology.
- (3) Economics of improvements in relation to benefits to the public health and safety.
- (4) Other societal and socioeconomic considerations in relation to utilization of nuclear energy and radioactive materials in the public interest.

b. Samples of good ALARA practices may be found in NRC Regulatory Guides 8.10, 8.31, and 10.8.

Background radiation

The radiation from cosmic (extraterrestrial) sources; radioactive materials naturally occurring on earth including radon (except as a decay product of source or special nuclear material), and global fallout in the environment incident to the past testing of nuclear explosive devices in the open atmosphere. "Background radiation" does NOT include radiation from source, byproduct, or special nuclear materials regulated by the NRC; or accelerator produced radioactive materials, radium, or machine produced ionizing radiation regulated by the DA.

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 vivo* counting) or by indirect (*in vitro*) 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 processed 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 "by-product material" regulated by the NRC under 10 CFR.

Calendar quarter

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

Class

A classification scheme for inhaled radioactive material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y which indicate a range of clearance half-times: Class D (Days)—clearance half-times of less than 10 days; Class W (Weeks)—clearance half-times of 10 to 100 days; Class Y (Years)—clearance half-times of greater than 100 days.

Collective dose

The sum of the individual whole-body doses received in a given period of time by a specified population from exposure to a specified source of radiation.

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.

Committed effective dose equivalent (CEDE) (HE,50)

The sum of the products of the weighting factors applicable to specific body organs or tissues that are irradiated and the committed dose equivalent of the corresponding organs or tissues. (HE₅₀ = S_wH_t,50).

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.

Critical organ

That organ which will sustain the greatest absorbed dose and whose associated damage by a radionuclide entering the human body will result in greatest potential impairment to the body due to the organ's radiosensitivity.

Declared pregnant woman

A woman occupationally exposed to ionizing radiation who has voluntarily informed, in writing, her employer and the RPO of her pregnancy and the estimated date of conception.

Deep dose equivalent (H(d))

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

Derived air concentration (DAC)

The concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2000 hours (40 hours per week for 50 weeks) under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an intake of one ALI. DAC values are given in appendix B, 10 CFR 20.

Derived air concentration-hour (DAC-hour)

A DAC-hour is the product of the concentration of radioactive material in air (expressed as a fraction or multiple of the DAC for each radionuclide) and the time of exposure to that radionuclide, in hours. 2000 DAC-hours may be taken to represent one ALI, equivalent to a CEDE of 5 rems (0.05 Sv).

Dose (D)

A generic term that can variously mean absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, CEDE, or TEDE.

Dose equivalent

The product of the absorbed dose in tissue (D) and the quality factor (Q) at the location of interest where H(T) = D(Q). The units of dose equivalent are the rem and the sievert (Sv). The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor; 1 rem = 0.01 Sv. The dose equivalent in sieverts is equal to the absorbed dose in Gy multiplied by the quality factor; 1 Sv = 100 rems. Its purpose is to have a single unit, regardless of the type of radiation, describing the radiation effect on man.

Dosimeter

A device intended to measure radiation or evaluate any quantity of irradiation for the purpose of determining an occupationally exposed individual's ionizing radiation dose.

Effective dose equivalent (HE)

The probability of a stochastic effect, for example, cancer induction, in any tissue is proportional to the dose equivalent to that tissue. The value of the proportionality factors differs amongst various tissues because of the differences in tissue radiosensitivity. If radiation dose is uniform throughout the body (whole-body irradiation), then the total risk factor is one (1). For nonuniform irradiation (such as partial body exposure to an external radiation field or from internal exposure where the isotope concentrates to different degrees in various tissues), W_T, which are based on the relative susceptibility of the tissues to stochastic effects, may be used to calculate an HE. The HE is thus the sum of the products of the dose equivalent to

the organ or tissue (HT) and the WT, applicable to each of the body organs or tissues that are irradiated. (HE=SWT HT).

Embryo or fetus

The developing human organism from conception until the time of birth.

Entrance or access point

Any location through which an individual could gain access to radiation areas or to radioactive materials. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.

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 therefrom; hence, sustain an exposure.

External dose

The portion of the dose equivalent received from radiation sources or devices outside the body.

Extremity

The hand, elbow, arm below the elbow, foot, knee, or leg below the knee.

Eye-dose equivalent

The dose equivalent to the lens of the eye from external exposure of the lens of the eye to some ionizing radiation source. It is measured at an eye lens tissue depth of 0.3 cm (300 mg/cm²).

High radiation area

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem/hr (1 mSv/hr) at 30 cm from the radiation source or from any surface that the radiation penetrates.

Individual

Any human being.

Individual (personnel) dosimetry

The assessment of dose equivalent by the use of devices designed to be worn by an individual; the assessment of CEDE by bioassay or by determination of the time-weighted air concentrations to which an individual was exposed or the assessment of dose equivalent by the use of radiation survey data.

Individual dosimetric devices

The devices designed to be worn by a single individual for the assessment of dose equivalent, such as TLDs, pocket ionization chambers, and personal air sampling devices.

Intake

The amount of radioactive material taken into the body by inhalation, absorption through

the skin, injection, ingestion, or through wounds.

Internal dose

The portion of the dose equivalent received from radioactive material taken into the body.

Investigational level

The CEDE from radioactive material taken into the human body or dose equivalent from an external radiation source to which the worker is occupationally exposed which justifies further investigation. Such an investigation generally includes a review of the circumstances associated with the apparently abnormal internal or external personnel dose equivalent, assessment of the consequences, and mitigation or prevention of such a personnel dose equivalent of similar magnitude in the future.

Ionizing radiation

Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly in its passage through matter. Ionizing radiation includes gamma rays, X rays, alpha particles, beta particles, neutrons, protons, and other particles and electromagnetic waves capable of producing ions.

Limits

The permissible upper bounds of personnel radiation doses.

Lower limit of detection

The lowest level of radioactivity that a system can detect with a given level of certainty. For further information, see NCRP Report 58, Section 7.1.3.

Member of the public

An individual, such as a visitor, in a controlled or unrestricted area who normally does not work at that particular installation or activity. An individual is not, however, a member of the public during any period in which the individual receives a dose equivalent in the course of routinely working with ionizing radiation sources or devices as part of their normal occupation.

Minor

An individual less than 18 years of age.

Monitoring

Also known as radiation monitoring or radiation protection monitoring. Monitoring includes the—

a. Measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material.

b. Use of such data to evaluate or document actual or potential personnel occupational exposures to ionizing radiation sources or devices.

Nonstochastic effect

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.

NRC

The Federal Nuclear Regulatory Commission or its authorized representatives.

Occasionally exposed individual

An individual whose work is not normally performed in a restricted area and whose duties do not normally involve exposure to ionizing radiation or radioactive material. Such individuals may, however, have reason to enter a restricted area in the performance of their duties. Examples are messengers, delivery persons, and maintenance workers.

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 nonNRC-licensed radioactive material as well as from machine produced ionizing radiation, whether in the possession of the owner of 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.

Planned special exposure (PSE)

An infrequent exposure to radiation, separate from and in addition to the prevailing permissible annual dose limits.

Protective action guide

The projected dose to reference man, or other defined individual, from an unplanned release of radioactive material at which a specific protective action to reduce or avoid that dose is recommended.

Public dose

The dose received by a member of the public from exposure to ionizing radiation from radionuclide or machine sources or devices for which the Army or DLA is responsible.

Quality factor (Q)

The factor used for radiation protection purposes that accounts for differences in biological effectiveness between different radiations. Such a factor (Q) when multiplied by the absorbed dose (D) yields a quantity (dose equivalent) which equates to a common scale the dose equivalent of any type of ionizing radiation to which an individual is exposed. These factors are specified in 10 CFR 20.

Radiation

For purposes of this pamphlet, a generic term that may variously refer to alpha particles, beta particles, gamma rays, X rays, neutrons, high-speed protons, and other particles capable of producing ionization. This term is NOT intended to connote nonionizing radiation, such as radiofrequency, microwave, visible light, infrared, or ultraviolet.

Radiation area

Any area to which access is limited as deemed necessary by the cognizant authority and in which appropriate precautionary measures are taken to protect personnel from exposure to radiation or radioactive material. A radiation area includes any area accessible to individuals in which ionizing radiation dose rate levels could result in an individual receiving a dose equivalent in excess of 0.005 rem/hr (0.05 mSv/hr) at 30 cm from the radiation source or from any surface that the radiation penetrates.

Radiation protection officer (RPO)

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

a. For installations and activities possessing NRC licenses—

(1) An individual who meets the training and experience criteria specified in 10 CFR; or

(2) An individual who has been formally approved by the NRC to serve as the Radiation Safety Officer incident to NRC review of the individual's radiation protection training and experience credentials.

b. For installations and activities NOT possessing NRC licenses: an individual whose radiation protection training and experience documents the equivalent minimum radiation protection training provided by—

(1) The Radiological Safety Course conducted by the U.S. Army Chemical School (for industrial, nonmedical RPOs);

(2) The Radiation Protection Course conducted by the AMEDD (for medical RPOs); or

(3) Other sources deemed acceptable by radiation protection professional staff at major Army command level or OTSG.

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 and 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 and density gauges.

i. Radioactive materials.

(1) Natural or accelerator produced radioactive materials.

(2) Byproduct materials.

(3) Source materials.

(4) Special nuclear materials.

(5) Fission products.

(6) Materials containing induced or deposited radioactivity.

(7) Radioactive commodities.

Radiation work permit

A locally developed form completed by the area supervisor and countersigned by the RPO prior to the start of any work in a restricted area. It describes the potential radiation hazards and protective clothing and equipment requirements for a given work assignment. It also provides a record of radiation exposures received by individuals during a given work assignment. The radiation work permit will be initiated by the area supervisor or the RPO when required to minimize the exposure of the radiation worker.

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 that state is long enough to be observable.

Reference man

A hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used to standardize results of experiments and to relate biological insult to a common base.

Respiratory protective device

An apparatus, such as a respirator, used to reduce an individual's intake of airborne radioactive material.

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 and 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.

Roentgen

The special unit of exposure. One roentgen equals 2.58×10^{-4} coulombs per kilogram of air. It applies only to electromagnetic radiation, that is, nonparticulate radiation, of photon energies between several keV and 3 million electron volts (MeV) that produce ionization in air only.

Shallow-dose equivalent (H(S))

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

Source material

a. Uranium or 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 percent) or more of uranium, thorium, or any combination of uranium and thorium.

c. Source material does not include special nuclear material.

Special nuclear material

Plutonium, uranium 233, 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 20. 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.

Survey

An evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of ionizing radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations, or quantities of radioactive material present.

System international units

These units have been established by the International Commission on Radiological Units and are used by many countries. As such, they may be encountered in the scientific literature. Historical, so-called "traditional" units of the rem, rad, and curie, equate to system international units in the following manner:

One gray (Gy) equals 100 rad

One sievert (Sv) equals 100 rem

One becquerel (Bq) equals 2.7×10^{-11}

curie (Ci); or equals One disintegration/second

One rad equals One centigray (cGy); or equals 1×10^{-2} gray (Gy)

One rem equals One centisievert (cSv); or equals 1×10^{-2} sievert (Sv)

One curie (Ci) equals 3.7×10^{10} becquerel (Bq)

Termination

The end of employment with DA, ARNGUS,

USAR, or DLA. Also, the end of a work assignment in a restricted area.

Total effective dose equivalent (TEDE)

The sum of the H(d) (for external exposures) and the CEDE (for internal exposures) expressed in units of either rems or sievert(Sv).

Unrestricted area

Any area access to which is neither limited nor controlled for purposes of radiation protection by commanders of DA and DLA installations and activities that possess and use ionizing radiation sources and devices to include any area used for residential quarters.

User

An individual who has been delegated the authority for the use, operation, or storage of radiation sources and devices.

Very high radiation area

An area, accessible to individuals, in which there exists ionizing radiation at such levels that an individual could receive in excess of 500 rads/hr (5 Gys/hr) at 1 meter from a radiation source or from any surface that the radiation penetrates.

Visitor

See Member of the public.

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 irradiation of that organ or tissue (T) to the total risk of stochastic effects when the whole body is irradiated uniformly. The W(T) values for calculating the H(E) are specified in 10 CFR 20.

Whole-Body

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

Section III

Special Abbreviations and Terms

This section contains no entries.

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